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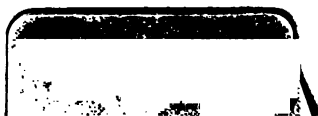
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FINIS PYRAMIDIS;

OR,

DISQUISITIONS

CONCERNING

The Antiquity and scientific end of

the great Pyramid

OF GIZA, OR ANCIENT MEMPHIS,

IN EGYPT,

AND OF THE FIRST STANDARD OF

LINEAR MEASURE.

ALSO,

A complete description of Solomon's Temple of which the true dimensions recorded in the Holy Bible are explained, and the erroneous opinions of commentators refuted; being a recent discovery.

AND,

Architectural Discussions on sundry controverted documents of Vitruvius. The canon of symmetries ascertained from his books. With the true ordination and disposition of some of the most celebrated Grecian temples, and strictures on Mr. Stuart's second Vol. of the Antiquities of Athens

BY THE REV. THOMAS GABB.

*How reverend is the face of this tall pile,
Whose ancient pillars rear their marble beads,
To bear aloft it's arch'd and ponderous roof.
Looking tranquillity!* CONGREVE'S MOURN. BR.

Bedford :

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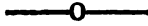
221. e. 173.



DEDICATORY EPISTLE

TO

His GRACE the DUKE of NORFOLK.



My Lord Duke,

The leisure, which, under Your Grace's favour and patronage, I have for some time past enjoyed, has enabled me to pursue a branch of study that has long been my favorite amusement. I had, some years since, discovered many errors amongst the commentators of Vitruvius, the only ancient author extant who has written on the Grecian architecture. But architectural essays, so frequently announced, seemed to deprive me of my chance of making the exposure of my discoveries interesting to the public : till musing of late upon the scientific discoveries made by the French Savants in Egypt, it struck my mind, their researches might be extended to some useful and interesting particulars concerning antiquities and the arts, which have escaped their notice. I accordingly applied some of their conclusions to certain metrical experiments analogous to my favorite study, and I flatter myself, with such success, as to render my discoveries, in both branches, in some degree acceptable. For in this disquisition, which I have requested to address to Your Grace, I trust, I have matured my metrical ideas : and detected many errors, both in the theory and practice of that style of architecture.

Every

Every motive induces me to present these fruits of my studies to Your Grace; and I feel myself peculiarly fortunate in making them public under the protection of the Noble President of the Society for the encouragement of the arts and sciences; hoping that I, too, may experience some small degree, at least, of that indulgence from the Public, which the ingenious publications addressed to that Society have uniformly obtained.

I am,

My Lord Duke,

Your Grace's

most obedient

and most obliged humble servant,

Thomas Gabb.

Workshop, November 30, 1805.

P R E F A C E.

The miscellaneous discussions, chiefly on architectural subjects, comprized in the following treatise, are neither intended to instruct such, as are wholly unacquainted with architectural documents, nor to present to the adept a full exposition of the multifarious matter comprehended in the ten books of Vitruvius, which have already appeared, with comments, both in the English, and in many foreign languages. But those translations and comments, on supposed ambiguities and apparent intricacies, met with in Vitruvius, even in documents rather interesting to architects, are by no means so satisfactory and conclusive, as to preclude all further investigation.

The design, then, of this publication is, in part, to expound some passages in the text of Vitruvius, hitherto deemed extremely obscure, and to expose some of the misconceptions of commentators, especially of Perrault: and this, not by an attempt to supply the meaning of our author, by arguments drawn from probabilities; but it is proposed to place the censured obscurities, and *their* misconceptions, in a full light, by conclusions drawn from incontrovertible premises.

There are many passages in the books of Vitruvius, which erudition alone is and always has been unequal to explain: and all the conjectures, which men of learning have ingeniously devised, to give a probable meaning to such passages, can never be satisfactory to a mind intent on the discovery of truth. A single well attested fact, or one fair demonstration, will always preponderate over

a multitude of vague surmises or mere conjectures, and will presently dispel the mists they had spread before the rays of truth.

Barbaro, Philander, Baldus, and some other commentators were, no doubt, men of acknowledged erudition, which seemed to promise great advantage in an attempt to explain an author, who wrote in a learned language, yet they have failed, on account of their deficiency in the practical knowledge of the art : and the ingenious Perrault, who perceived this, and had the advantage by seeing their false steps, of chusing better ground, has however, deviated more from the true path, on some occasions, than any of his predecessors ; for they generally attempted to explain obscure passages, but Perrault, as often as he found the text too inflexible to bend to his meaning, rejected it altogether, as corrupted, and inserted in its place a text of his own framing ; and has but too often succeeded in persuading his admirers that, by these corrections, he has restored the true reading of the text : amongst these is Felibien, who as often as he quotes Perrault, seems to rest on his authority, as on the *ne plus ultra* of architectural investigation.

The case seems to be, however paradoxical it may appear, former essayers were too inferior and Perrault too superior an architect, to be faithful and accurate commentators of Vitruvius ; for Perrault, born rather an architect than a physician, abandoned the medical profession, and made a sudden and astonishing progress in this art : he soon became an adept in that style of excellence, that prevailed in the new academy, which consisted of selections only from the Roman antique : prepossessed in favour of that school, and little acquainted with

with Athenian and other Grecian remains, he became a flattered practitioner, before he had duly studied the documents of Vitruvius. Sensible of the superiority of his own talents above his co-temporaries, endowed too with taste and genius in the art, he precipitately undertook a French version of Vitruvius, with ample comments, replete with amusing information, valuable discoveries and almost every thing curious and estimable in the art, except the true meaning of the text.

Thus prepossessed he aimed to exhibit the documents of Vitruvius as the result of the Roman antique of which he was enamoured, rather than as the criterion by which their irregularities ought to have been corrected and their intemperate excesses exploded. His delusive example has, in a great degree, perverted the true Attic taste and biased the judgment of the greater part of the moderns, who have written, since his time, on architectural subjects. Yet Vitruvius, more than once, informs us the documents he has transmitted, are such as he had received from his Athenian masters, and speaks of his parents in the highest strains of gratitude for having procured for him the blessing, as he deemed it, of an Athenian education.

They who are acquainted with the early progress of Grecian architecture, need not be here informed that it had almost arrived at its acme, before the Romans, inured to the art of war alone, had conceived any ideas either of this, or any of the liberal arts. Restrained by austere laws, from every attempt at magnificence, it was long before any enterprizing genius ventured, from behind the shield of opulence, to brave the menaces of the laws ; and the first who was so bold, merely introduced an imperfect imitation of a few small columns, in the entrance of his house, of the most inferior marble.

This example, deemed at first extraordinary and licentious, by degrees lost its singularity, and others were stimulated by it to exceed that moderation, and erected more sumptuous structures, in defiance of the laws, which, when so ill obeyed, were at length repealed: yet only the opulent and extravagant characters were the promoters of grandieur and magnificence: the austere habits of the elder citizens remained long averse from such innovations, and no encouragement was held out to youths of genius, to apply their talents to the study of the liberal arts. Hence this art of architecture even to the age immediately preceding the Augustan, was practised only by working masons, and even by slaves,* under the guidance and direction of their opulent masters, who retained some idea of Grecian magnificence, and Grecian symmetries, without the rules, whereby alone true symmetry, elegance, and perfection are attainable. The Roman structures, therefore, even in the Augustan age, were but the productions of ill-trained workmen, and only imperfect imitations of Athenian, Syracusan, Corinthian and other Grecian paragons. And this is what Vitruvius, who wrote in that age, clearly intimates, when he complains, that, altho' Rome then abounded with architects, or rather masons, not the most skilful, but the most enterprizing, were the men employed in their public works.

* See Mr. King's very curious notes, in his *Munimenta Antiqua* Vol. II. p. 200, 201. wherein is inserted an original letter of Cicero to his brother Quintus concerning the improvements of his villa; and wherein we are informed that Cicero bought his house of M. Crassus, who had bought 500 slaves that were more or less skilled in building, and hired them out to those who were willing to build. And Mr. King thinks Cicero hired some of those slaves and amongst them, Diphilus of whose deficiency he complains in his letter.

Whoever will read Pliny on this subject, will be convinced of the truth of the description here given of the unfavorable commencement, the inauspicious progress, and consequent imperfect state of architectural magnificence at Rome, just before and immediately after the first emperors.

Now the remains of such structures became the object of the most earnest avidity of the academicians of Paris, who sent Desgodetz to Rome in search even of every fragment of their ruins, which, in about ten years he collected; and highly finished plates were engraved from his accurate drawings, and published by royal munificence: and these are the Roman antique, by which, exclusively, Perrault seems to have been guided, in his comments on Vitruvius. And this, in part accounts for the many misconceptions into which he was betrayed, upon reading the text of Vitruvius; and for the frequent corrections he made, and distortions of the text, to conform it to the ideas he had preconceived from these examples of the Roman antique; from which Vitruvius himself, we may venture to affirm, never framed a single document, throughout his whole canon of symmetries. Yet because he was a Roman and wrote in latin, (for no better reason exists,) many have concluded, as Perrault seems to have done, that he assisted himself in composing his work, by the then existing examples at Rome.

This error most of the moderns have given into; and amongst them the writer, to whom the architectural department was consigned, in Mr. Wilks' *Encycl. Lond.* Vol. 11. p. 74; who asserts, that Grecian architects so disposed the columns of temples, as to have in the side row, one column more than double the number of columns

sumns in the front ; and cites the Parthenon at Athens as an instance. But, continues this writer, the Roman architects disposed the side row, with one column less than double the number in front, and instances the temple of fortuna virilis at Rome. This latter disposition is, no doubt, clearly taught by Vitruvius, but by no means in the sense of this writer. On the contrary, this rule, laid down by Vitruvius, is derived as well as all his others, from Grecian architects, and exemplified in the Ephesian temple, which was proclaimed by Pliny, the admiration of true Grecian magnificence ; and this temple had, as the rule teaches, fifteen columns only on the side, to eight on the front. And the architects of the Parthenon placed seventeen to eight on the front, not by choice, but impelled by imperious necessity, as is fully explained in the first and in the last chapters of this treatise : the Parthenon, therefore is nothing to the purpose in question, being wholly irregular. But though this writer has been misled in following too servilely, the letter-press *imputed* to Mr. Stuart, he has nevertheless displayed great ability in his judicious compilation, which throughout the whole architectural department, is far more correct and complete, than in any preceding publication of that kind.

Another very prevalent error has past current amongst the moderns, for many centuries back, and which, by some unaccountable inadvertence, has not till now been detected, concerning the linear foot measure attributed to Vitruvius, to Pliny, and to other authors of theirs and preceding ages : by which has been understood, either the Roman foot perpetuated by the monuments of Cossutius, Vespasian and Statilius ; or the Greek foot, attributed to Greek authors, and transmitted

mitted to us as being ascertained by the hecatompedon Parthenon at Athens. And our Countryman, Mr. Greaves, professor of astronomy at Oxford, something more than a century ago, took great pains when at Rome, to discover the true Roman foot amongst those monuments; to this end, he attempted to ascertain the measure, from one mile stone to another, but baffled by their unequal stations, he could not depend on that criterion, and therefore decided, after diligent researches, in favour of the Cossutian foot, the least of the three, which is to our foot, as 967 to 1000: not once suspecting but that the foot, by which Pliny, Vitruvius and other Roman authors, calculated, was one or other of these monumental feet, viz, either 967, 972, or 986 of 1000 parts into which, our foot is imagined to be divided. Whereas about 732 of 1000 will be proved, in the following treatise, to be the size of the foot used by those Roman authors, in common with almost every civilized nation, in theirs and the preceding ages.

The many incongruities discovered in dimensions recorded by Vitruvius, Pliny, and Herodotus, in the acceptance of any of the monumental feet, had long since convinced me, these authors must have made their calculations by a foot measure very different from these and the Greek foot published in our tables; since by the Roman Cossutian, and the modern Greek foot, it is impossible to reconcile some of their reported dimensions, to common sense. Under this well-grounded persuasion, I had bent my endeavours to discover, if possible, what the size of the foot could be, which these authors used; but, till lately, nothing occurred to me, of a satisfactory import. The recent discoveries, however, made by the French Savants in Egypt, gave me a

hint, which I have not neglected ; but have improved to an extent of discovery, whereby not only the real size of the foot, used by these authors, is completely ascertained, but also some other particulars brought to light, which I flatter myself will be found by no means uninteresting.

The foot measure, then, demonstrated, in this treatise, to be that assumed by Pliny, Vitruvius, and to this day, by the architects at Rome, will be proved, from premises supported by undeniable arguments, to have been the foot used by the Egyptians, by the first settlers at Athens, by Herodotus, by the Syracusians, Corinthians &c

I shall commence my essays with this investigation, since without knowing the size of the foot, by which authors have reported dimensions, either of magnificent temples, or other wonderful structures, whereof no remains exist as a criterion, we can form no just idea : nor can we have any certainty of the real extent of geometrical lines recorded, in ancient authors, by the foot or cubit, unless we know the standard from which they are derived, and compare the same with our own.

This position no where more forcibly obtains, than in perusing the dimensions, recorded in the Holy Bible, of the most renowned and magnificent temple, ever beheld by human eyes. Whereof the architectural perfections, both in the disposition and in the symmetry, Villalpandus would persuade us, were inspired, immediately by heaven, into the mind of Solomon ; and insinuates, that both the Egyptians and Tyrians, as well as the Greeks and Romans, derived their principles of architecture from that noble source. The Scriptural narrative, however, authorizes no such conclusion ; on the contrary we there read, Solomon himself acknowledged the
superiority

superiority of the Tyrian architects, and exemplified his own superlative sagacity, by his application to that nursery of architecture and the other liberal arts. Pursuantly King Hiram sent him another Hiram as the most accomplished and experienced adept in the arts and sciences; and who was, or at least was styled, the King's own father. See 2 Chron. chap. 2. v. 13.

Tyre is said, in history, to have been distinguished for it's magnificent structures; and who can question it, since this illustrious sage had set such an example to the rising geniuses of his time, and was so eminent in the architectural arts himself, as to have been qualified and designed, it should seem, by providence, to concur with the wisest man on earth, in planing and perfecting a paragon of architecture, a temple to be dedicated to the service of the living God.

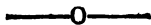
The description of this temple, as recorded in the Holy Bible, is attempted in Chapters viii, ix, x, and xi. Before I enter upon discussions on heathenish temples, one excepted, viz: the Ephesian temple, which, for reasons there assigned, is very fully treated of, previously: and in reality, it was converted into a Christian church in after times, and before it's utter destruction.

In concluding this preface it seems incumbent on me to make some apology for many obscurities of expression, and some other blemishes in language, which might give an opponent great advantage in a controversial engagement; but for which, in the following essays calculated for very different purposes, I hope for indulgence from such of my Readers, as have been accustomed to the pleasure experienced from the precision and elegance of certain modern publications, who will frequently experience very different sensations, I fear, on perusing

perusing the ensuing discussions, which are chiefly technical subjects, involved in elaborate calculations replete with abstruse deductions and necessary repetitions; and wherein the periods are sometimes unavoidably protracted into a length incompatible with that harmonious cadence, the ear expects, when habituated to the perfection of number, which invariably recommends many modern publications.

Surely my apology may find admittance, when it is considered, how extremely difficult it is to attend to the concinnity of expression, and rules of composition, when the mind is intensely engaged in perfecting the arrangement of argumentative premises, whence the most interesting conclusions are expected to be drawn.

FINIS PYRAMIDIS, &c.



CHAPTER I.

OF THE MODERN GREEK FOOT, ORIGINATING FROM
A MISAPPREHENSION OF THE HECATOMPEDON PAR-
THENON AT ATHENS, AND OF THE TRUE ONE FROM
THE ANCIENT PARTHENON.

VITRUVIUS in his description of Tuscan temples, 7th. chap. 4th. book, says, the variation from the first plan he had described in the beginning of the chapter, was after the manner of the first temple erected to Minerva, in the Acropolis of Athens, and in fact the Minerva Polias, delineated by Mr. Stuart as he found it, in the Acropolis, exactly answers to the disposition related by Vitruvius, though the present columns are evidently both more massive and their capitals altogether different from those Vitruvius describes, from which we might know, that after the destruction of the original temple by the Persians, the present remains belong to the rebuilt temple.

The first Minerva Parthenon was nearly coeval with the Minerva Polias, and shared the same fate by the Persian conflagration, leaving to posterity, like the Polias, the foundations and traces of it's ichnographia, on which, in after times, it might be rebuilt in it's pristine disposition and character, which tradition teaches was the hecatompedon, viz, an hundred feet in front: this ancient Temple was rebuilt on it's former foundation-walls by Pericles, and amply decorated with additional magnificent columns, both in front, postern, and each side, all which Mr. Stuart has minutely measured and planed exactly as he found them.

From

From Mr. Stuart's delineations it is manifest, the ancient Temple was an hexastyle amphiprostyle hypethre, and as there can be no doubt of the walls of the original being of brick, as the first settlers under Cærops came from Egypt, and must have been perfectly well acquainted with the use, as well as with the method of making bricks; and could not be expected to have acquired such opulence, so soon after their first settlement in a foreign land, as to have had it in their power to erect the walls of their first dedications, of marble or stone; but contented themselves with six marble, or other stone columns, in the front and posticum of this Temple: moreover we know, the walls even of the magnificent Olympian Temple at Athens, long after the age of Paricles, were of brick: we know also, the ancients were unacquainted with the practice of burning bricks. And that unburnt bricks were in very great esteem, we learn from Pliny; though inferior to wrought stone, or such as Vitruvius calls cementa, which he teaches, were to be used instead of bricks, when circumstances require a less thickness of wall, than attainable with safety in the use of brick.

Since, then, there can be no question but the walls of the first Parthenon were of brick,* and unburnt brick required a much broader foundation than stone or marble, the principles of sound building required the stone walls, erected on the old foundations, to be set off, along the middle of them, leaving on each side a more considerable margin than was left, when at first brick walls were raised on these same foundations. We learn from Mr. George Wheeler, who visited Athens, in the
year

* See Pliny lib. xxxv. Chap. xiv.

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ERRATA.

Last p. of Preface, *read* cadence. p. 27, l. 23, *read* conceiving. p. 31, l. 23, *read* reasons are. p. 36, l. 14, *read* that the. p. 37, l. 5, *read* same. p. 42, l. 2, *read* by. p. 67, l. 17, *read* Moyes. p. 82, l. 28, *read* dissimilar. p. 83, l. 19, *for* pycnostyle, or $1\frac{1}{2}$ diameters, *read* systyle or 2 diameters. l. 21, *read* systyle. p. 96, l. 16, *for* and more than a line, *read* and little more than $\frac{3}{4}$ of a line. p. 105, l. 30, *read* last. p. 109, l. 7, *read* problem. p. 114, l. 3, *read* height of 120. p. 136, l. 8, *read* columns. p. 143, l. 23, *for* before, *read* upon. p. 153, l. 6, *read* inclosed. p. 157, l. 20, *read* orientem. p. 163, l. 5, *read* inclosed. p. 171, l. 16, *read* architettura. p. 196, l. 29, *read* than. p. 198, l. 28, *read* 7. p. 209, l. 14, *read* uninteresting. p. 275, l. 2, *for* and, *read* et.

year 1676, that the rebuilt temple was altogether of white marble. This much being sufficiently proved ; before I draw the inference in contemplation, I have next to prove, the original temple was amphiprostyle, and hexastyle. Here I have to combat an apparent opposition, from the definitions of Vitruvius, who, in book III. Chap. 1, defines a prostyle, a temple that had four columns in front and no other external columns ; and the amphiprostyle, a temple with four in front and four in postico, and the cell in the middle, with a pronaos at each end of the temple.

That this is the import of the definitions, is not to be denied : yet it is not hence to be inferred, that *only* tetrastyles could be called prostyle and amphiprostyle ; since Vitruvius himself records an instance of a temple dedicated to Ceres and Proserpine at Eleusis, of the greatest celebrity, excessive magnitude, built entirely of marble, and classed for it's magnificence and splendor with the Ephesian Diana, and the Olympian at Athens ; and yet had no external columns at all, but it's excellence and splendor were confined to the peristyle cell, which was hypethre : this temple, says Vitruvius, "in after times was decorated with front columns by Phylon, and made a prostyle : " and in proof that Phylon erected before it more than four columns, the front line of it was above an hundred English feet in extent, as may be gathered from the verbal description of it by Vitruvius, who in his preface to 7th book, speaking of the Olympian at Athens, proclaims it's cell to be large, (*cellae magnitudinem*) ; but just after calls the cell of this Ceres and Proserpine immensely large, (*cellam immani magnitudine*), of course much larger than that of the Olympian which in Mr. Stuart's plate has 98 feet 9 inches English ;

and hence we may fairly conclude that the front of the Ceres was 120 feet at least, which if only four columns even in systyle intercolumniation would produce a diameter of 12 feet : which is larger than any of the gigantic columns of Egypt. But if six columns are supposed and in systyle, then will the diameter be 7 feet 6 inches, and this is much larger than the columns of the Olympian, the Parthanon, or the Ephesian Temple. Therefore an hexastyle was called by Vitruvius a prostyle.

And that the first ancient Parthenon was hypethre, the traced circles (besides Wheler's testimony) described in Mr. Stuart's plate, are a demonstration beyond all possibility of doubt.

But in clearing the way for drawing the inference in view, it is not sufficient, I grant, to have proved, that Pericles's marble wall left a considerable margin on the foundations, on each side of the new wall ; that an hexastyle may properly be deemed prostyle or amphiprostyle; and that it might be hypethre : but it is moreover necessary to shew sufficient reason to conclude it was *merely* hexastyle, and not an octastyle periptere, as the new Parthenon is seen to be : for on this assumption depends the fate of my Achilles.

First, then, in Mr. Stuart's delineation of the whole ichnographia of the new erection of the Parthenon under Pericles, it is seen at first blush, that the external columns, eight in front and postern front, with seventeen on each side (reckoning the angular columns twice,) surrounded an heterogeneous kind of building altogether dissimilar to them both in elevation, disposition, style, and character; for the platform, on which the walls, with their six columns at east, and six at west end, is elevated

ted above the platform of the external ambient columns full 2 feet 4 inches English, and is ascended from the lower platform, by two steps.

Secondly, the symmetry of the six columns at each end, accords not with that of the external columns, the diameter of the six being 5 feet $6\frac{1}{2}$ inches, that of the others 6 feet $1\frac{1}{4}$ inch ; nor do the six mediate large columns of the octastyle front and postern, range with the six on the elevated platform, as in all regular temples they invariably do.

Thirdly, the six columns on the higher platform, both rise much higher than the external columns, and support an epistyle wholly unconnected and dissimilar, in symmetry and character, to the epistyle, over the external columns ; which epistyle is charged with regular Doric triglyphs and methopes, in the freeze above it, whereas that over the six columns, has no triglyphs at all in its freeze, which is continued all round the walls over the epistyles of the elevated Temple, charged with an uninterrupted procession in a kind of messo-relievo.

These three arguments are abundantly sufficient to prove this hexastyle amphiprostyle Temple, elevated so much above the platform of the larger columns, that surround it, and in an unconnected course with it, and in every respect different from it, could only have been thus disposed, in the new erection, not by the free choice of the architects employed, but by the determination of Pericles and Phidias, who out of veneration for the ancient Temple, insisted upon rebuilding on the same site, on the very same foundations, and in the exact same disposition : and displayed their taste for magnificence by surrounding it with forty-six larger columns, rising from a platform somewhat lower ; thus giving the new

erected work the appearance of a periptere; which on account of the great length of the walls of the building, in proportion to it's breadth, and for no other reason, they were obliged to depart from the well established symmetries and perfection in disposition, by giving seventeen columns to the length, instead of fifteen, which the eight in front regularly required: as exemplified in the famous Ephesian Temple, and taught by Vitruvius's Athenian masters, who had this Parthenon before their eyes, and well perceived in it the reason of the deviation from their rule.

Hence it is not only proved the ancient Parthenon was not octastyle, but merely hexastyle; but also the hasty assertion in the Encycl. Lond. Vol. 11. p. 74, that the Greeks gave one column more to the side than double the number of front columns, is refuted. See Preface above p. 5.

Since, then, the ancient Parthenon, demolished by Xerxes, and thus restored by Pericles, is acknowledged by Historians to have been hecatompedon, that is to have extended an hundred feet in front, of course the front of the new octastyle could not possibly have been confined to an hundred feet of the same size, since the hundredth part, of that new front, must have been as much longer, than the hundredth part of the elevated hexastyle front, as the whole extent of the octastyle, exceeds the whole extent of the hexastyle.

Therefore from all the above premises, which I humbly conceive are well grounded, I draw this inference that the most ancient *foot measure* in use amongst the first settlers in Cecropia, is *clearly to be ascertained* from the restoration of their ancient dedication to Minerva, called Parthenon and *Hecatompodon*. "The Persians had

had burnt the original "fabric, which before occupied the site, and was called *Hecatompodon*". See Mr Wilk's Encycl. Lond. Vol. II. p. 469.

From Mr. Stuart's accurate measurement both of the ancient restored temple, and of the magnificent columns, that surround it; we have the precise dimensions of the front line, from out to out of the walls; but before I proceed to ascertain the size of the foot by a division of that line; that every part belonging to the ancient front, may be taken into the account; I shall calculate the difference between the thickness of walls of unburnt brick, and that of walls of marble or stone, to ascertain the quantity to be added to the outside margin of the marble walls, which without that margin, form the boundaries of Mr. Stuart's measure, for thus only can be ascertained the true extent of the ancient walls of brick.

Now Vitruvius mentions three sorts of bricks used by the Greeks, the *πενταδωρον*, the *τετραδωρον* and the *διδωρον*, the last, i. e. the didoron, he informs us was in use amongst the Romans, and says it was a foot long and half a foot broad: (but here I must notice that the foot which Vitruvius assumed will be proved, in the sequel to be 8.7552 of our inches): as then the didoron, which means two palms, was equal to 8.7552 inches, by the same ratio the tetradoron was 17.5104: and the pentadoron 21.888. And we learn from Vitruvius, Book 2. Chap. 8, that builders at Rome, were restrained by law from making walls more than a foot and half, (equal to 13.1928 of our inches, by the foot which will be proved to be that which Vitruvius used), therefore, says Vitruvius, they could not build such walls with brick, though a didoron and half would have been strong enough for one story high, but as the increased population

tion of Rome, required their houses to be carried up to three or four stories, brick and half would have been unsafe : (for their unburnt were certainly much weaker than our burnt bricks): they were obliged to use the stones called *cementa*, though the thickness of three bricks laid lengthwise, had the law permitted, would have been safe in any number of stories. Hence we have the ratio of strength between brick work and stone, the latter 13.1328 of our inches, to the former three brick's lengthwise equal to 26.2656 of our inches : or in a double ratio.

The thickness, then, in Mr. Stuart's plate of the *ichnographia*, of the marble wall is ft.3, in.10.3, of English measure, whereof the double is ft.7, in.8.6, and the wall conducted along the middle of the old foundations, in this case, had a retrenchment on each side of the former brick wall of ft.1, in.10. This ratio, however, is established on the supposition of the sufficiency of three didorons when brick, to a foot and a half or in. 13.1328 of stone. But as Vitruvius says the Greeks in their public buildings used the brick called *pentadoron*, we must seek the ratio in that kind of bricks ; the length of the *pentadoron* is=21.888 ; the exact double ratio will not here obtain, for neither one, nor one and a half, nor two *pentadora*, will be commensurate with the foot and half, or, 13.1328. We must, therefore, assume such a number of the *pentadora* as approach the nearest to twice the thickness of the marble wall, which is ft.3, in.10.3, the double of it ft.7, in.8.6 ; and the length of three *pentadora* is, with one inch allowed for the two joints, just ft.5, in.6.664 and the ft.3, in.10.3 taken from this, there remains for two margins ft.1, in.8.364 and this added to Mr. Stuarts front line of ft.71, in.3.1 produce
for

for the front of the ancient Parthenon with brick walls ft.72, in.11.464 which divided by 100 quote 8.75464 of our inches, for the ancient foot measure of the first settlers at Athens.

Having thus far shewn the Ancient Parthenon to have been an hexastyle hypethre and hecatompedon in front, by which this precise foot measure = 8.75464 of our own inches, is obtained ; it is natural to expect some account should be given of the circumstance, that determined the colony of Cecrops to such a particular size of foot : and secondly, whence it has happened that the hundredth part of the new octastyle front, should have been handed down to us, as the Greek-foot, under an idea that the said octastyle was the hecatompedon of the ancients. The first of these enquiries I shall make the subject of the next chapter : and as to the latter, it follows as a necessary consequence, however prevalent the contrary notion may be, that if the ancient Parthenon was hecatompedon, the octastyle front could not be so too ; yet it may easily be conceived, that a people so often ruled by new governors, so harrassed by wars, so discouraged by an ignorant democracy ; the wisest, the best, and the most learned so often either banished or induced to emigrate to more peaceful shores ; the progress of the arts so often interrupted and even by long intervals discontinued, they might easily forget, or rather distant generations never know, the denominations, even much less the exact quantities of the measuring rules of their ancestors, who flourished under Pericles : who no doubt would have been strangely surprised, could they have had a foreknowledge, a time would come, when a general opinion would prevail of the then new octastyle, Parthenon, being the ancient hecatompedon, and furnishing

nishing a foot measure so foreign and dissimilar to the foot of man, and to the hundredth part of the real hexastyle hecatompedon.

From the above causes, however, it might easily happen, that all distinction, of the old and new Parthenon, might sink into oblivion, though a confused tradition of the name parthenon hecatompedon might be preserved to a late posterity ; who in a servile condition, under the Roman conquerors, found leisure and encouragement to apply themselves to the arts and sciences, which, in their more turbulent ages, had been suspended : and thus finding a want of a proper foot measure, were led into error, by a tradition of the Parthenon being hecatompedon; and took the octastyle for the line of an hundred feet; and this tradition perpetuated to these times, also misled Mr. Stuart who industriously set about to ascertain the Attic foot, by comparing the front line with the side, and finding between them a commensurability, was well pleased with his erroneous assumption of an hundredth part of the octastyle front line for the Attic foot, without reflecting that he had in reality discovered nothing, for supposing all the columns and inter columns had been of any other size whatever, the front and side line would have been equally commensurate, provided the exisoma, as Vitruvius calls it, obtained in the side.

This much may suffice to account for the adoption and prevalence, in these latter ages, of the erroneous Greek foot, which is something more than ours, and much more than the monumental foot at Rome.* I now proceed to account for the adoption of the smaller foot.

* It is a very questional decision that has been drawn from these monuments at Rome, concerning the size of the Roman foot : this will be discussed in the sequel of this tract.

foot, one hundred of which were assigned to the front extent of the ancient Parthenon, by the settlers under Cetraps or by their descendants, long before Pericles built the octastyle.



CHAPTER II:

OF THE ORIGIN OF THE TRUE ANCIENT GREEK
FOOT AND MATTERS DEPENDANT ON IT.

FOR many centuries past the great pyramid of Giza has been deemed a sepulchral monument, but on no other authority, than vulgar opinion, which has been followed both by the learned, as well as the illiterate of modern times. Pliny, indeed, though equally at a loss with Herodotus and others *his* ancients, to guess at the primary end which the founder of so stupendous a work had in view; yet he intimates not any idea of a sepulchral purpose.

As many, however, of the modern literati as have of late visited the pyramids of Egypt, have labored under the erroneous persuasion of the design being intended, by the founder, for a place of burial, or for superstitious purposes, and have given themselves no further trouble in searching into it's origin, than merely to relate what others have said, wrote, and thought of it; concerning, I suppose, that since Herodotus made so little discovery of it's real destination, and only recorded the fables which the Egyptian priests taught him, concerning a Cheops and other ridiculous stories; it were but time lost to attempt any further investigation, either of the end or of the founder: and hence proposed to themselves merely to satisfy their own and their countries curiosity, by measures and descriptions of it's immense size and singular

gular contents ; all credulously looking on the curious oblong rectangular granite chest, a fixture in the upper chamber, as the coffin which had once contained the corpse of the founder, some slightly measured it, others reported how it rang like a bell, others that the lid had been purloined ; and to complete the measure of absurdity, call it a sarcophagus : and all record it's dimensions so vaguely, as to prove they thought precision unnecessary.

Mr. Greaves, however, in habits of correctness, for he was professor of astronomy at Oxford, in his visit to the pyramid, more than a century ago, measured this granite Chest very carefully, and states it to be in length ft.7 in. $3\frac{1}{2}$ English measure ; and he took great pains to ascertain all other internal and external dimensions, but the latter he measured on the adventitious surface, like other visitors before him.

The French, however, while in possession of Egypt, pushed their researches still further, and not only agree with Mr. Greaves as to the length of the granite chest, but moreover dug out the sands at the corners of the pyramid, till they discovered the apophyge of the reclining sides ; and there taking the measure, from corner to corner, at the very foundation, have ascertained the side of the base to be just 400 of the Nilometer cubits at Cairo = the great Egyptian stadium ; in English ft.729, in. $7\frac{1}{4}$. And the granite chest in the upper chamber is exactly one hundredth part of the said side of base, being 4 cubits of Cairo = ft.7, in. 3.552 English. Which is but .052 of an inch more than Mr. Greaves states it, who probably might have perceived that small fraction, but on purpose omitted it, to retain the more simple measure of $\frac{1}{2}$, and as of no sort of consequence in an object he deemed to be a coffin. I have

I have given all the dimensions of this pyramid in the Gents. Mag. Sept. 1803.

This discovery of the centesim standard of measure, the *granite chest*, brings home a demonstration to the mind, more forcibly than a thousand arguments, that the founder of this surprizing pile, whoever he may have been, caused that excavated chest to be deposited where it stands, and whence he knew it could not be taken away, as a perpetual criterion whereby, without actual measurement, the exact length of the side of the base might always be known : and amongst other things which will be noticed in the sequel, it demonstrates the early prevalence of centesims or hecatoms, which must have been very usual and familiar to those first inhabitants of that part of the earth ; since this standard Chest is not reported as charged with subdivisions or characters demonstrative of its use, independant of a knowledge of it's being a centesimal criterion ; a knowledge habitual to the founder, but derived thus late to us by the recent experiment,

Such is the antiquity of the pyramid, that Pliny found it's origin as well as the real founder, out of the reach of his inquisitive research : and five centuries before him Herodotus by no means could trace it up to any epoch : and were I to broach an opinion of its having been erected by the antediluvians, there wants not more of argument than I could adduce, to bear me out.

But the question at present is, not it's antiquity, but it's destination : and when from the manifest absurdities that ensue from the idea of the corpse of a sovereign prince drawn through passages, that require a living man to pass on his hands and knees, and up and down descending and ascending long narrow gal-

eries to be, after all this, to be deposited in an oblong angular chest without a lid, it is fairly decided that it never was intended for a sepulchral monument: it is natural to bend our endeavours to discover some more feasible end.

Now the base of the pyramid being, to a certainty, discovered to be, in each of it's sides, 400 cubits; and the granite Chest found to be just the centesimal part of a side; and also just a tenth part of the front of the ancient Parthenon hecatompedon at Athens, of course the length of this Chest, = 4 cubits, contains 10 feet, of the size of those, whereof an 100 were contained in the front line of the Parthenon destroyed by Xerxes, and restored on the same site and on the former foundations, by Pericles, as proved in the preceding chapter. And since the emigrant Egyptians under Cecrops are thus proved to have brought with them the customary foot measure of the country they left, and the tradition of it perpetuated to the time they, or their descendants, built the first Parthenon; (since such coincidence between the size of the foot by which their hecatompedon was determined and the tenth part of the length of the pyramid Chest, could not have happened by accident), it is manifest the ancient Egyptians used that same size of foot.

Yet surely no reader will hence infer that I could for a moment suppose, the end of erecting this astonishing pile, was only to environ and secure a standard of perpetual durance, of the cubit and foot measure; useful as such a standard then was, and now might be. No doubt some further utility and more important end was in contemplation, when such a plan was invented. What I at present contend, and, as it appears to me, is
duly

duly inferred from facts, is that the ancient Egyptians derived their foot measure from this granite Chest, as their standard, and that Cecrops with his colony, took this precise foot measure from Egypt, when he went to found the Attic state, well acquainted of the permanent immutable standard, from which it had been originally taken. Copies of which standard chest were, no doubt, dispersed over Egypt and its dependances; and that brought by Lord Cavan from Alexandria, measured without the astragals at the ends, is the same in length as that in the pyramid, as declared to me by Mr. Hay of Portsea, who measured it on board the vessel, while it remained in Portsmouth harbour.

Whatever, therefore, may have been the greater and more scientific purposes for which this magnificent pile was erected and intended by the founders, they militate not against the appropriation of the enclosed chest for a standard of ten feet. On the contrary, the more important and permanent this grand pyramid was known to be, the more likely it was, that they would assume from it, their standard of measures for the common, but necessary uses of society.

In this and the preceding chapter sufficient reasons adduced to prove this precise measure of in.8.7552 of our inches, was the foot of the first settlers at Athens, and long before them in use amongst the Egyptians. I shall pursue this disquisition still further, and shew that this very measure, (allowance being made for the unavoidable loss or increase of two or three hundredths of an inch, occasioned by the variety of transfers from old to new specimens), was the foot of the Syracusians and of course of the Corinthians: is the foot by which Vitruvius, Pliny, and the ancient Greek authors, whom
he

he quotes, made their calculations of various things and dimensions, which they record. The foot also used by Herodotus, Hipparchus, and is, at this day, the very same measure, called (probably to distinguish and preserve it from being confounded with modern feet) by an other name, used by the architects of Rome under the denomination of *Palmus Romanus*. All which I now proceed to prove in the following chapter : reserving some further observations on the more noble end and utility of this pyramid for a subsequent chapter.



CHAPTER III.

OF THE PERPETUITY, UTILITY AND UNIVERSALITY OF THE ANCIENT FOOT MEASURE.

ALL dimensions are conceived under one or more of three ideas, a line, an area, or a solid. I here substitute, area, for superficies or surface : because, with due submission to the learned, it appears to me, that we may conceive in our mind a correct and true idea of an area, on account of it's actual boundaries by lines ; but our notion of surface, is void of precision for a globe visibly has surface, but for want of lines, we can have no correct notion of the dimension of such a surface : as in reality no mathematician could ever correctly measure it.

At present, however, we have only to rectify our perception by the true idea of a line. But as a line may be longer or shorter, or rather as no line is either long or short, but by comparison : in order to know the quantity of the various denominations of linear measures, by which, ancient authors have recorded dimensions of sundry magnitudes ; as by the foot, cubit, pace, perch, stadium. &c. we must previously be in possession of two
requisites,

requisites, the one, a measure of some known established quantity, decimally or otherwise divided; the other requisite is, access to the objects, whereof the dimensions are recorded in denominations of measures different, in value or quantity, from the established measure we assume; and by actual measurement of the same object, we shall know, by comparison, the value of the measure, by which those authors calculated. When I say access to the objects, I mean such objects as are still in existence, or at least were so, when measured by those who used our established foot such as the pyramid, by Mr. Greaves; the broken remains of the Ephesian Diana's columns, recorded by Barlow; the Parthenon and Olympian at Athens, by Mr. Stuart, &c. All these I call accessible; they have been all measured by our foot, and those measures recorded.

Therefore when Herodotus says the side of the base of the pyramid of Giza is 800 feet long: when Pliny relates that the front of the Ephesian temple was 220 feet; and the reclining side of the pyramid was in altitude 883 feet and 25 more wanted to reach an apex; (a part of the top being demolished). When Vitruvius teaches that a flight of steps up to a temple, in order to have an easy ascent, should have the riser of a step not more than ten twelfths of a foot, and the tread not more than two feet; what can we know of the size of the foot these authors used, but by recourse to the objects, either by ourselves, or by those on whom we rely who have measured them by our foot.

We have, then, the dimensions of the following objects, in English measure. The base of the pyramid ft. 729 in. $7\frac{1}{2}$: the granite Chest ft. 7 in. 3,552 long, just one hundredth part of the length of the base, and containing

taining 10 feet of the value of the foot, which is repeated an hundred times, in the front of the ancient Parthenon; thence called hecatompedon : and the tenth part of ft.7, in.3,552 is in.8,7552, which I shall hereafter call the pyramid-foot. Besides the pyramid and the Parthenon, we have also, recorded by Barlow, the measure of the diamater of some fragments of the columns, 40 feet long and broken off some feet above the base of the Ephesian temple ; which diamater, when measured, was found to be 7 feet : of *this particular* I shall have occasion to avail myself in the sequel.

The utility of this discovery of a foot of in.8,7552 of our measure, and .7296 of our foot, when we read dimensions in ancient authors recorded by the foot, or by other denominations dependant on it, as the cubit, the passus, the stadium, must be apparent to every reader ; if it can be satisfactorily proved, that both the ancient Greek and Roman authors actually calculated by a foot of that precise length. And though enough has been already said and proved to evince the truth of such an assertion : yet as it may appear somewhat problematical to some, and even paradoxical to others ; I shall proceed with the particulars, that prove each author to have used this precise measure of 8,7552 of our inches, as the foot. Claiming, as above mentioned, an allowance for a small variation, in some instances, of the very minute part of an inch, affecting only the second and third place of decimals, but never altering the 0,7 which is the first decimal. And surely so small a difference, in the hundreds and thousands into which an inch is parted, cannot be fairly argued to defeat coincidence : rather should it be matter of surprize, that in a lapse of so many centuries, and after so many specimens copied and sent from country

country to country, no greater variation has happened, and this may be urged as a decisive proof of the advantage of a permanent and universal standard.

To begin, then, with Herodotus : he asserts that the length of the side of the base, in the greatest pyramid, is 800 feet : now if these were such feet as are handed down to us by the moderns of a few centuries back, (as the Greek or Attic foot, which is something longer than our foot) his record is grossly erroneous ; even if we were to suppose that he, like the French of late, had opened the sands and measured at the foundations, where it is found to be but 729 such feet. But there is no reason to believe, Herodotus either dug out the sand and rubbish to find the foundation, or used a foot measure even longer than ours ; or if he had, that he would have made such a blunder in his measuring, and inserted it in a history read by him before the highest and most learned assembly in the world, and continually liable to a disgraceful detection. No doubt, he measured on the adventitious surface, and the foot he used was the pyramidal, 800 whereof are equal to $583 \cdot 816$ of our measure : and at the foundations the length in pyramidal feet is just $1000 = 100$ times the length of the granite Chest $= 400$ cubits of Cairo.

Didorus Siculus who measured this base above four or five centuries after Herodotus, states it at 700 feet. And Mr. Greaves little more than a century ago, most accurately measured the same on the surface he then found, and made it 693 English, and this equal to 949.8 of pyramidal feet.

Hence it follows, as far as the accuracy of these recorded dimensions can be depended on, that the accumulation of the sands about the pyramid were higher when Herodotus took the measure than at the time Mr. Greaves

took his dimensions : and still higher than Herodotus found them, when Didorus measured. In reality, so variously are these dimensions given by all travellers since Didorus, as to invalidate the account of their reports ; Mr. Greaves, however, is certainly deserving of credit, and from his and Herodotus's statement of dimensions, I have some further discussion in view. But to return to the subject in hand, we may safely depend on the inference from the above statement, that Herodotus measured by the pyramidal foot.

I now undertake to prove, that Pliny and the authors he quotes, in his Natural History, calculated by the pyramidal foot. First, he reports, in Chap. 14th, Book 36th, at the celebrated temple of Diana at Ephesus, measured in front 220 feet, on the side 425: now these dimensions in an octastyle, viz, eight columns in front, (which Vitruvius informs us was the character of that temple) are commensurate *only* in the spaces of intercolumns, called systyle, and with *only* fifteen columns in the outward row on the side : now the nature of the case, as well as the document of Vitruvius, teaches that to find the diameter of a column in an octastyle systyle, the front line, exclusive of the projectures of the angular bases, is to be divided by 22 : but if the said projectures are included, since each is a quarter of a diameter, of course the divisor must be 22.5 for the front, and 43.5 for the side. The 220 divided by 22.5 quote ft. 9.777 : and 425 ÷ 43.5, quote also ft. 9.7701149 : thus there is not the eighth of an inch difference between the two quotients. Therefore the diameter of the column was ft. 9. in. $9\frac{1}{4}$: and if these were of the least of the monumental Roman feet, still they produce ft. 9 in. $5\frac{1}{2}$, which is larger than the famous Alexandrian column called Pompey's pillar by $6\frac{1}{2}$ of our inches. Now

Now the commensurability between 220 and 425 : that is 8 columns in front and exactly two diameters for intercolumn, with projectures of angular bases added, produce just 22 diameters and an half; and $220 \div 22.5 = 9.77$: and 15 columns with some intercolumn and addition of angular base's projectures, produce $43\frac{1}{2}$ diameters and $425 \div 43.5 = 9.7678$: this I perceived some years ago, but startled at so enormous a diameter for the column and for other reasons stated hereafter, I concluded Pliny had mistook the dimensions.

But lately, after the discovery of the pyramidic foot, finding it recorded by Barlow, that several fragments of the shafts of the columns were discovered amongst the ruins of this temple, of 40 feet in length and seven feet in diameter ; (and these broke off above the base, make it certain, that the diameter at the apophyge was a trifle more than 7 feet :) I was led to make experiment, by reducing the ft.9.777 to the pyramidic feet, by the multiple .7296 (the decimal fraction of our foot, equal to the pyramidic foot,) and found it produced ft.7, in.1 $\frac{1}{2}$. Hence it is impossible to doubt of Pliny's dimensions being by the pyramidic feet: and 220 such reduced to English by .7296, will produce only 160 .. 6.144 for the front, and 425 produce 310 .. 0.96 for the side length.—Pliny also says Chap. 23rd, Book 36th, that when base and capital are added, the height of the column is then one third of the front extent, = ft.73, in.4 pyramidic feet ; which, reduced to English, produce 53 .. 6.048. And these dimensions of breadth 160 .. 6.144, length 310 .. 0.96, height 53 .. 6.048 and diameter 7 .. 1.5383, assimilate the columns of this Ephesian Temple, to the columns of the famous Olympian and Parthenon Temples

ples at Athens ; viz, this Ephesian being Ionic, is very properly more lofty than the Parthenon column, which Sir Geo. Wheler states at about 44 English feet high ; and Mr. Stuart found it's diameter 6 .. 1.8, and by this Doric ratio between the diameter and height of the column, were the Ephesian to be supposed also Doric, with a diameter of 7 .. 1.5 it's height then should be but 50 .. 11.5 ; but known as it is, to have been not Doric but Ionic, the ratio between the diameter 7 .. 1.5 and the height 53 .. 6, is perfectly what it ought to be. And thus the scale, on which the Ephesian Temple was built, is a medium between the Minerva Parthenon and the Olympian Temple at Athens, which has columns, ten in front, on a diameter of 6 .. 3, and are in height about 60 feet, being Corinthian. This circumstance alone, independant of the above demonstrative proof from the fragments of columns found and measured, would be sufficient to refute the hypothesis that the 220 feet and the 425 were either Cossutian Roman feet, or English ; from the great improbability of a diameter of above 9 feet English ; which would have produced an elevation and extent of temple so far exceeding that even of the Olympian, which for magnificence, was the wonder of the world, as to render the supposition altogether out of the question.

Hence it is incontrovertibly proved, that Pliny calculated by the pyramdic foot: and not only so, but I proceed now to prove that the authors he occasionally introduces in his work, as the ancients before his time, also used the same foot.

But before I can draw a satisfactory conclusion, from the recorded dimensions of objects stated by those authors, I must premise a few words concerning the ancient measure

measure, called Stadium, which was determined by a stated number of paces (passus) in the manner the acre is determined by a fixed number of perches, viz, 160, let the perch be more or less, for in some parts of England the perch is $16\frac{1}{2}$ feet, in others 24 feet, as in Staffordshire. In like manner the pace (125 of which was the linear measure, called a Stadium,) is in itself of various lengths. The word passus is certainly of Roman etymology; but when vocabularies are consulted, in search of it's import, all we gather amounts to nothing: some vocabularists deriving it from pando, insinuate that it means the space equal to the greatest extension of the arms, which is about six English feet: others a space equal to the length of a stride, the greatest that can be made by a middle-sized man; and this, though still but vague, is more reasonable, for certainly a pace is more congenial with an exertion made by the feet than by the arms. The average of such strides, will be found about ft.3, in.8 English: and the half of this may reasonably be assumed, for the length called *gressus*, i. e. a step; and a gentleman* walking at ease, takes not more than ft.1, in.10 each step: thus restraining the vague origin of *gressus* and *passus*, to a practical average, in our own known measures; it is natural to inquire why the Romans estimated the *gressus* at $2\frac{1}{2}$ feet, and the *passus* at 5 feet? And the solution of this problem is, shat the foot, by which these are determined, was undoubtedly the pyramidic foot, of which 5 are equal to ft.3, in.7.776. And this is what the average of men's strides, will be found

* By Lord Chesterfield's rule a Gentleman should not be seen to walk in a hurry like a man of business; of course he takes a shorter step.

found to be: 125 of these passus are therefore, the Roman stadium = 625 feet, and of the pyramid standard.

This being premised and settled; I shall now instance an example, from Pliny, Book 2nd. Chap. 10 of dimensions stated by Hipparchus, [well known to the learned for his extraordinary abilities, both as an astronomer and as a proficient in other branches of mathematics,) as the correct measure of the earth's circumference, viz, to the erroneous measure of 252000 stadia by Eratosthenes, he added 25000 stadia, and thus made the circumference 277000 stadia, which multiplied by 625, the feet in a stadium, (waving here all discussion of what kind,) produce 173 125 000 feet, if Pliny has recorded accurately.

Now by the late calculation of a meridional degree taken in the latitude of $45^{\circ}..43$, it was found to be 365576.4 English feet, which multiplied by 360, produce 131 607 504 for the circumference in question. If, then 173 125 000 are to be reputed of the value of our foot (and the Cossutian is nearly the same,) then the great and learned Hipparchus is argued to have erred in his calculation by an excess of more than forty-one million five hundred thousand feet English, which, in 13160750 is, indeed, an unaccountable blunder; but by no means to be imputed to Hipparchus, but to those, who misconceived the value of the foot he calculated by, which was no doubt that of the pyramid-standard: and by this foot, his dimensions are even 8 758 000 too little; which may be in part accounted for, although an excess of nearly 42 000 000, admits of neither rectification nor apology. But for the deficiency of 8 000 000 of feet, we may partly account from the difficulty he must have found in bringing

ing his* new invented instruments to bear, with any tolerable exactness; when even in the present highly improved state of sectors and quadrants, in experiments lately made, there was found a difference between two accomplished mathematicians, of above 64 feet English, both measuring in the same latitude, one single meridional degree.

And after all, my present engagement is, not to rectify the deficiency in the calculation made by Hipparchus, but to prove the stadia, by which his recorded 577 000 are notified, were of 625 pyramidic feet each: and this, I presume, will be allowed to be sufficiently proved, since an error of 8 000 000 is not so incorrect as an error of 41.

I next proceed to state the reasons which prove that Vitruvius also calculated by the pyramidic foot, where he alludes to established measure, for most of his quantities are symmetrical or commensurate. In Chap. 3rd, book 3rd, he recommends steps up to temples not to have more than 10 Inches (dextans) risers, nor more than 2 feet treads, (bipedales,) that the ascent may not be difficult; as matrons, he elsewhere tells us, were accustomed to ascend arm in arm. And if these dimensions had been by the Cossutian foot, we may easily imagine these Roman ladies, had they heard Vitruvius call the ascent easy and pleasant, would impatiently have pronounced him ridiculously singular in his opinion.

Now the dextans of the pyramidic foot is = $\text{ft. } 7\frac{1}{4}$ very nearly in English, and the two feet for the tread = $\text{ft. } 1 \text{ in. } 5\frac{1}{2}$; whereas by Cossutian feet the dextans = $9\frac{1}{2}$ nearly, and the bipedales = $\text{ft. } 1 \text{ in. } 11\frac{1}{8}$; here let the reader decide

*Hipparchus is said to be the first that invented mathematical instruments.

decide whether this be not a sufficient proof, that Vitruvius calculated for the pyramidal foot.

But a further proof is gathered from what he relates concerning the size of bricks (Chap. 2nd, Book 3rd,) he says the Greek had three sorts of bricks, the didoron ($\Delta\delta\omega\rho\omega\nu$), the tetradoron ($\tau\epsilon\tau\rho\alpha\delta\omega\rho\omega\nu$), and the pentadoron ($\pi\epsilon\pi\tau\alpha\delta\omega\rho\omega\nu$). The didoron was that in use at Rome, and to prevent misconception of the real size, from the name didoron, which means of two palms, he immediately tells us it was a foot long and half a foot broad. Now the most that can be made of two palms is a length = $6\frac{1}{2}$ or 7 of our inches : but Vitruvius knew that the measure, termed a palm, was a mere vague denomination, assumed by men in an uncivilized state, and whatever was about two, but not three, was called didoron ; when about three, but not four, they called that length tridoron ; when about four palms, they called it tetradoron, and so on. And the case seems to be, that in a more enlightened state, they still retained the same denominations, but restrained them to precise quantities, yet so, as not to call a length of three palms, by the name didoron ; which didoron we find here called by Vitruvius a foot long : and by this reasoning, three palms would have been more than a foot ; yet the most that we can make of them, would be $10\frac{1}{2}$ of our inches, of course the foot Vitruvius alludes to, must be less than $10\frac{1}{2}$ inches.

But though this proves something in favor of the pyramidal foot, the argument is but negative : I shall therefore adduce a more satisfactory proof, that will be better understood from what is premised, than it would otherwise have been.

Vitruvius, then, Chap. 8th *ibid* : informs us that when the population of Rome became too numerous to be

lodged in houses within the boundaries of their city, which were built only one story high, (i. e. what we call a ground floor), they were obliged to build houses of several stories high, and of course to make the walls very considerably thicker; and lest they should too much narrow the streets, by the great thickness of the walls, the law restrained them to the thickness of one foot and an half; thus impeded by law from building street-fronts of brick, they were obliged to use either wrought stone or that kind called cementa: for though a *didoron brick and half*, which would form proper bond, sufficed for houses on ground-floors, they must have had, says Vitruvius, *two or three bricks length-wise* for the thickness of the walls, when they were run up several stories high.

And here I must just observe, what the reader may depend upon, that the Romans at first, as well as the Greeks, used only unburnt bricks; a fact which Mr. King, in his *munimenta antiqua*, treats rather too problematically.

Now from all that is above premised concerning bricks, and all is fairly extracted out of Vitruvius, it is most manifest, the foot and half, allowed by law, could not be of the Cossutian foot: which would produce $1\text{ in. }5\frac{1}{4}$, a thickness, of even brick wall, sufficient for a height of four stories; whereas Vitruvius says the foot and half admitted of the use of brick work *only* on ground floors.

As Vitruvius, then, said before, that the *didoron*, used by the Romans, though by it's name it implied a length of two palms = $6\frac{1}{2}$ or 7 of our inches, was a foot long yet was not three palms $10\frac{1}{2}$ of our inches; it follows that the foot, to which he alludes, must have been of a length somewhere between 7 and $10\frac{1}{2}$ inches English: and $7 + 10\frac{1}{2} = 17\frac{1}{2}$, and this divided by 2 quotes 8,75, and the

F

pyramidic

pyramidic foot is 8.7552: certainly, as 52 of 10 000 parts in an inch, is no object, the reasoning is conclusive and it is fairly proved, Vitruvius and the Roman people used the foot of the pyramid standard, which exactly falls in with, illustrates, and verifies all above said of prohibitory Roman law.

That the Syracusians still use this foot, we know from our common tables, wherein it is noted 8.758 our inches, and called the foot of Archimedes : and variation between this and the pyramidic foot is only parts of 10 000 into which an inch is divided, no odd in itself, and might easily have happened in transferring from old to new specimens : and I have repeatedly found as much as a sixteenth of an inch variation in our two foot rules. No wonder, therefore, some smaller difference should be found in ancient specimens even when engraved on brass ; since the ten thousand part of an inch is an imperceptible quantity.

And if we make an allowance, even in a less degree than is found amongst our carpenters rules, for unavoidable minute errors in transferring from one instrument to another ; it will be found, that the Roman Architect at this day, use a measure, (under a different denomination, probably the better to distinguish it from modernly invented foot-measure,) so near to the pyramidic foot, as to preclude all doubt of it's having for it's origin : in our tables it is noted in the decimal fraction of our foot, .732, this multiplied by 12 produces 8.784, and by subtracting the pyramidic foot 8.7 there rests the difference only of $0.0288 = \frac{3}{1000}$ of an hundred and twenty-six into which an inch is imagined to be divided, very nearly ; how easily might so small a difference have happened in the lapse of many centuries, and can

see

sceptic even deny, that the measure called the *Palmus Romanus* of 8.784 to be the continued tradition of the pyramidal foot. The utility, therefore, of this discovered foot, in reading and consulting ancient authors, is made apparent : and its perpetuity and universal adoption, till within a few centuries back, is proved incontrovertibly from facts of sufficient notoriety.



CHAPTER IV.

OF THE MEASURE CALLED CUBIT, AND OF THE ANTIQUITY OF THE GREAT PYRAMID OF GIZA, WITH OTHER INCIDENTAL OBSERVATIONS.

THE moderns appear to have been as uncertain and divided in opinion concerning the measure called Cubit, as they have been confused and discordant about a fixture of measure for the foot. And this will ever be the case, when superstructures are raised on false ground. The fallacy seems to spring from the prevalent notion, that the origin of linear measures was no other than the members of the human body, as the denominations of such measures sufficiently indicate : and what ground more unsettled and vague.

I have already, in the preceding chapter, discussed, as far as necessary, the origins called palm, foot and passus : and come now to the denomination Cubit, concerning the value and quantity of which, very strange opinions and assertions have been advanced, some maintain it to be a foot and half, without any specification of the kind of foot to which they allude : others contend for a foot and three quarters, and leave us to guess what foot they mean. Some would have us believe the origin

of the cubit, the term itself indicating something appertaining to the elbow, is the length from the extremity of the elbow to the end of the middle finger : others with rather more propriety, (as the whole elbow in their notion is included,) say it is to be taken from the shoulder to the wrist, since from the wrist to the extremity of the middle finger, is appropriated to another denomination, called by the Greeks *Orthodoron*. But all these are vague unsatisfactory determinations, to a mind intent on the discovery of truth.

The measure called Cubit, then, is derived from the same permanent standard, from which the original foot measure has been inferred, and undeniably ascertained to have been in almost universal circulation, till within a few centuries preceding our time. In the Pyramid of Giza, then, we shall find the standard of the Cubit : for the Granite Chest therein fixed, furnished the ancient Egyptians, not only a foot measure, for common uses, by one of the ten parts, into which it's length was divided; but also, by an assumption of a fourth part of it's length, they obtained an authentic integral measure better adapted than any other to a purpose, the most important to them of all others, viz, a criterion called *Nilometre*, by which they ascertained the gradual rise of the fertilizing waters of the Nile : since their lands were only fruitful in proportion as those waters rose and expanded. This larger measure which admitted of 24 digits, is, at this day, the Cubit of Cairo.

These cubits are now called by the Inhabitants of Egypt *Draa el bellady*, interpreted peek,* 20 of these
peeks

* See Views in Egypt by Luigi Mayer Boyers historical gallery Pall-Mall, 1801.

peeks are graven on a column, the base whereof stands on a level with the bed of the Nile, the column being inclosed in the centre of a round tower with an aperture at the bottom to admit into it the waters of the river, with which it communicates. Two of these peeks (i. e. two cubits) are left at the bottom of the column without any divisions marked on them, as the sludge usually settles to that height, the other 18 peeks, or cubits, are each divided into 24 equal parts, or digits, and for more convenient perception, the column is dressed in cants; so that a peek begins on the right hand cant, and the line, where that terminates, passes on to the left hand cant, and there commences the second peek; then a peek to the right hand cant, and so on alternately to the completion of the number of peeks, each having 24 digits marked in the stone. These 20 peeks are equal to ft.36 in.5 $\frac{1}{2}$ English: or exactly ft.36 in.5,76

Now the granite Chest, in the pyramid, comprizes in it's length just four peeks, or cubits, and in the height of 20 peeks, is repeated five times: and it has been before conclusively proved that a tenth part of the length of this Chest was the foot universally adopted by the ancient Egyptians, Greeks and Romans, down to the time of Pliny, perhaps long after, since we find it is still used at Rome by architects, certainly the most likely characters to retain it.

As this standard Chest, in length 4 cubits is=ft.7, 296, or, ft.7 in.3,552 English: of course one cubit is =ft.1,824, or, ft.1 in.9,888.

But of the ancient foot, of the pyramid-standard, the cubit comprizes 2 $\frac{1}{2}$; the Nilometre 20 Cubits=50; the Gressus or step 1 Cubit=2 $\frac{1}{2}$; the Passus or pace (see proof in last Chap.) 2 Cubits=5; 50 Cubits=125
which

which is the fifth part of the stadium ; 250 cubits=625, which is the Roman or Italian stadium ; 2000 cubits=5000, which is the Italian mile containing 1000 paces of 5 pyramidic feet each.

And 4 Cubits the length of the granite Chest, =10 pyramidic feet is the fathom of the Hebrews : and is a very convenient length for a measure to carry in the hand ; after the manner the French carry the toise, the Romans the cane, (which is in reality the 4 Cubits with only an excess of about $\frac{7}{17}$ th's of an inch English, as accounted for in last Chap.) and as we use our ten foot rod.

And 400 Cubits=1000 pyramidic feet equal to the side of the pyramid's base, and is the Stadium of the Egyptians. 200 000 Cubits=500 000 pyramidic feet are equal to a meridional degree, if taken very near the equator: of course 72 000 000 of Cubits equal 180 000 000 of pyramidic feet, are equal to the circumference of the Earth ; these pyramidic feet reduced to ours=131 328 000 : and by the degree, lately measured, by the French, in 45° .. 43 latitude, the circumference, in our feet, is 131 607 504. The difference of 279 504 feet, may partly be accounted for, if we conceive the builders of the pyramid, took the degree at, or near the equator ; for different experiments have been made in various latitudes, and the degrees are invariably found longer, the nearer the trial is made towards the pole : Mr. Norwood, our country-man, cautiously made the experiment between London and York, somewhere about 52° latitude, and found 132 190 560 for the circumference by his measure of a degree, and the difference between him, in 52° latitude, and the French, in 45° latitude, is much greater, being 583 056 feet, than
between

between the astronomers of the Pyramid, and the French. The difference of latitude from $45^{\circ} .. 43'$ to 52° , is $6^{\circ} .. 17'$. The founders then, of the pyramid, by taking the degree somewhere between the equator and 38° latitude ; have as good a title to reputation in astronomical accuracy, as either the French or Mr. Norwood.

From this decisive and pleasant concurrence of facts, the reality of the quantity, the utility, the antiquity of the origin of the pyramid Cubit is fairly proved, and is satisfactorily ascertained in English measure ; though incommensurate with the Paris pied de Roy, or any of the monumental Roman feet : and this greatly facilitates calculations made by English feet, when required to be ascertained in equivalents of pyramidal feet or cubits.

But before I draw any further inferences from the discoveries, or perhaps I should say revival of facts, (sunk, through the inattention of the learned, into a temporary oblivion), now submitted to their consideration, by one who has little to boast of beyond taste and diligence, in such a pursuit ; I will hazard the experiment and see what progress I can make in the investigation of the antiquity of this interesting monument, this paragon so replete with principles of science, the great Pyramid of Giza, or ancient Memphis.

There appears no convincing reason to conclude the other pyramids to be coeval with this, as may be gathered from the sequel of the present discussion. I have before observed, that were I to hazard a conjecture of this pyramid being erected by the antediluvians, I should not want for arguments to bear me out. But if I have deceived myself, and should fail in this attempt : still the pyramid will neither fail, nor suffer any diminution of its beneficial utility in assisting in further discoveries.

It

It has been a very prevailing, not to say general opinion, that the sands which environ the Pyramid and hide a great part of it's reclining sides, next to the foundation, have been drifted by the winds from other parts of those regions, and lodged, in the circuitous strata now seen, on every side of it. A strange property, surely, must be imagined in those winds, thus invariably to combine their efforts, to bury this stupendous mountain of art, without ever taking back any part of their deposit. Strange, however, as it appears to me, it has been received by most writers and visitors of the pyramid, which opinion I now shall venture to combat.

At the time Herodotus reported the length of the side of the base to be 800 feet, (proved above to be of the standard Chest and equal to ft.583, in.8 of ours), all will agree that he dug not, like the French of late through the sands, in search of the exact length of the foundations of a pile, which he was led to believe to be a sepulchral monument; but only measured on the adventitious surface, and that probably to no great exactness, but thought a few feet of no such consequence as to spoil the round number 800, by inserting them.

Now if the surface had continued to rise by the incessant arrival of sand; as, about 2000 years after Herodotus, Mr. Greaves, professor of astronomy, most accurately measured the side of the base also on the adventitious surface, he must have necessarily found, from 2000 years accumulation of sand against the inclining sides, a much less length of side, than Herodotus records; whereas he made the length 693 feet English, which exceeds it by 110 feet. And the learned admit that we may depend on the veracity of Herodotus in such matters as fell under his cognizance; and who can deny

may Mr. Greaves an equal character? This inference, then, may fairly be drawn, that the winds in those regions have been imperceptibly stripping the sand-covered sides of this Pyramid, for at least 2000 years, instead of increasing the accumulation. This conclusion, however, rests not entirely on the accuracy of these stated dimensions. The argument is supported by these further considerations:—

All who have written on the Pyramids, agree in one point, though scarce any two in many others, that the sands which cover the surface of the rock, and are accumulated about the sides of the Pyramids, are adventitious. But by what agency, is the question? Most have taken it for granted, without further investigation, they have been brought by the winds: and indeed we read of wonderful effects thus produced in those regions of the earth: as tremendous columns of sand, raised by the impetuous whirlwinds, to the great terror of the alarmed travellers: but where do we ever read of these phenomena becoming stationary even for a day? Common observation teaches us, that fine sands and pulverized earth, are invariably driven by the wind from higher grounds and summits, and lodged in vales. All readers and travellers know the surface, whereon the Pyramid stands, is the summit of an extensive rising ground or covered rock, at a sufficient distance from the mountains of Lybia, to give the winds free access to the site, whereon the Pyramid is built. And it is directly contrary to common experience, to attribute that deposit of sand to the agency of the wind, since the removal of it is rather the natural and invariable effect of that agitated element. And that this has been the case with the sands deposited about the Pyramid, the greater altitude of them at the

time of Herodotus, and the less altitude, when MG Greaves visited the Pyramid, seems to be a proof waiting nothing but accuracy in their statements, to b demonstration: and though no man is infallible, can i be reasonable to argue two such reputable characters as Greaves and Herodotus, could either of them, in s short a length, as at most one stadium or furlong, have deviated from the other and from truth, by 110 feet?

But if this deposite of sands is not the effect of th winds, by what agency came it there? Not by any ex traordinary over-flowing of the Nile, from which a se diment might be left; for it is known, that river neve rose to near the height of that plain of rock, nor ar there any kind of shell-fish in the Nile; whereas shel and petrified oysters are found in the sands about th Pyramids.

And it must be allowed, when this Pyramid of Gi z was built, there were no such depths either of sands < earth upon the rock, as in the time of Herodotus, fro the absurdities that would follow such a supposition since the builders must first have dug out their deptl of sand equal in extent to twelve English acres; and when their work was completed, must be argued to have filled in, against the acclining sides, to the level of the former surface, and thus have buried a considerable part of their own work.

From these positions, it evidently appears, this Pyramid must have been erected by the Antediluvians: and, the universal deluge, called Noah's flood, and the description given of it in Holy Writ, will account, in a satisfactory manner, for the lodgment of sands on the surface of that extensive rock.

We

We know the dreadful effects even of a partial inundation : in these days, we frequently hear of the turbulent element sending down such impetuous torrents of rain, as to force away trees and cottages, and harrow up the verdent sod, blending the soil, the loam, the clay and sands, with it's rapid current, as it rolls to distant vales, and lets down the stolen burthen, when once at rest. How awfully and more violently did all this take place in the wrathful flood that deluged the earth : when the windows of the skies were opened and the gushing torrents fell precipitate on land and seas, tearing up the natural strata, disturbing the sandy-beds of rivers, hurrying away promiscuously heaps of corn, shrubs, lofty elms and oaks, with the fostering glebe, which cherished them, into distant vallies, and buried all with heterogenous matter, forced up by sudden bursts of mountain-like torrents, from the angry clouds! What wonder then, the appropriate and natural stratum of rich soil, which, at first, clothed this extensive rock and displayed a beauteous verdure, should then be torn off and driven, partly, perhaps, to the Nile and to other rivers, and partly to the seas and distant vales : and the stripped rock, after the waters ceased to rage, received from their sediment, in place of it's former coating, a cumbersome burthen of blended shells and sands, to become in after times, when dissolved and pulverized by the calcining heat of the sun, the imperceptible employment of the busy winds.

These sands, on the subsiding of the waters, were probably very near the summit of the Pyramid. Nor do I doubt but the apex was severed from it by the impetuosity of the waters, while in their unabated rapidity, and thus left the flat, which has furnished various

conjectures. It is natural to conclude the heavier particles of sand, when the waters became tranquil, would sink first, and the lighter particles of course, both on account of their texture, as well as their more exposed situation, would easily pulverize, and be sooner conveyed by the winds to distant places, than the ponderous compressed layers, intermixed with shells and portions of loam, which more immediately covered the sides of the Pyramid, nearer to the rock. Of course the reduction of this consolidated mass, has been, by slow degrees, and it's dispersion, by the winds, so imperceptible, as to defeat observation.

Hence it may have easily come to pass, that the visitors of this Pyramid, who became it's historians, might judge, the sands which encompass the Pyramid on every side and extend over the plain, were either the natural coat, or at most increased by an accession of sand brought by the winds: and the deception, concealed by these apparently natural effects, could only be detected by some such experiment as I have herein suggested, viz, the comparing of dimensions taken at very distant periods.

In about 2000 years, viz, from the time of Herodotus to the present, I calculate the height to have been diminished about 95 of our feet, and at present only about 30 of our feet remain, which the French dug through at the corners of the Pyramid, and thus ascertained the real length of the side of the base: and by the calculation made, it appears, if the dimensions by Herodotus and Greaves may be depended on, that the winds have removed the sands, at the rate of about 47 feet perpendicular in a 1000 years: then by allowance made for the more rapid progress in removal, from the advantage

advantage the winds would have on the greater altitude of the sands, we will take the average at 40 feet, each of the 4000 years since the deluge, which makes, inclusive of the present 30, an altitude of sands, at the subsiding of the waters, equal to 190 feet, and the entire altitude of the Pyramid from the centre of the area of the base, to the vertical point of the apex, is ft.681. 85. and the side of the base ft.729.6 English.

Hence it will be found that the solid contents of the Pyramid is=4 152 394 cubic yards. And the square of the base multiplied into 190 feet, (the altitude of the sands after the flood) produce 101 140 070 cubic feet =3 745 928 cubic yards. This I insert, to show the absurdity of the opinion of the Pyramid being built since the deluge, because the builders must have had to dig out and remove a quantity of sand, almost equal to the solid contents of the entire Pyramid, which, when finished, would have been encompassed by a depth of sand almost one third of it's height.

But if any should be so sceptically inclined as to question the above position upon the mere possibility that Greaves or Herodotus, or even both, may have erred in their dimensions; and may have differed above 100 feet from each other; at least, they cannot expect to find credit, if they pretend the winds have brought the present accumulation: for whoever read of winds that imperceptibly convey fish shells, and petrified oysters to such a distance? Now the present strata, taken at the altitude of 31 feet, would produce an excavation equal to 611 177 cubic yards, which the builders according to these sceptics, must have had to dig out and clear away: a task altogether as incredible, as the supposition of the conveyance of shells is absurd.

I cannot omit to notice, before I proceed, a particular, that seems to me rather extraordinary, viz, that so many ingenious and learned men, have taken so much pains to ascertain the dimensions of this Pyramid, under a full persuasion of it's primary end being for a sepulchral purpose. For on this supposition, what benefit to mankind, or what interest could the most curious antiquary have in ascertaining it's precise width and height? The case is indeed of late, different; and it is now, no longer an object of mere curiosity, but of very essential utility, both by furnishing a criterion by which recorded dimensions read in ancient authors, as Herodotus, Vitruvius, Pliny and others, are ascertained; and also by holding out for our acceptance, a permanent, and primeval standard of measure, whereof the adequate divisions, might long since, have determined the denominations of less measures, had it been adhered to, without the interruption of the various, injudicious, and discordant determinations of measures throughout the different nations of the world, which prove that such an universal standard has been a desideratum, for many centuries past.

With how much more propriety, then, might the French literati have adopted this standard, proved, (above p. 48th) to be a meridional degree, only in a different latitude, from that, in which they measured theirs; and how much more likely to succeed in recommending it to other nations, since it perfectly accords with ancient and primeval measures? While the metre they have set forth, and vainly held up as a portion of a standard from nature, agrees not with any other established measure, either ancient or modern: I say vainly, because it is not true, that they have measured and found the exact meridional

ridional degree, in any of the latitudes, wherein they have made the experiment; as professor Bygge has very convincingly proved. But this subject will be resumed in a subsequent chapter. To return, then, from this short digression,—

I must allow that all the proofs adduced in support of the antediluvian origin of the great open Pyramid, equally apply to the contiguous Pyramids; but this by no means proves, that because they also are of antediluvian date, it is necessary they should be coeval. Certainly from the creation, to the time of the deluge, the great number of inhabitants of the earth, were as liable to have a select number who might be as equal to such enterprizes, as an equivalent number can be argued to be, since the deluge; nay, rather more equal if strength and stature avail, since we read of many of them being giants (Gen. Chap. 6th.)

I shall offer my reasons presently, for believing the great Pyramid, the subject of this discussion, was erected long before the others, in it's vicinity: which, when proved, accounts for the destruction of it's apex and coating: while the others, erected nearer to the time of the deluge, it may be even 1000 years after the great one, retained both their apex and coating: in which lapse of time, the coat or casing of this first pyramid, might become by age less firm in the beddings, and more easily fall a prey to the raging torrent, which, for the same reason, forced away the apex.

Convinced as I am of these Pyramids being antediluvian, I come now to the investigation of the founders, and of the end they proposed in building them. And first, who was the founder of the great open Pyramid? We are informed by Josephus, that a memorial was preserved

preserved amongst the Jews, of an ancient tradition, that the most religious of the long-lived ancient fathers, before the deluge, who were the most direct descendants of Seth, had employed much of their time in putting together successive astronomical observations; the remembrance of the first of which, had been preserved, by the posterity of Shem.—Pursuantly with such tradition, Josephus even goes so far as to intimate, that Almighty God bestowed on those ancestors of mankind, a longer term of years, on account of their commendable exertions and good use they made of their time in astronomical and geometrical discoveries; which required a longer period of time than that allotted since, for the life of man.*See Antiq. Judeorum lib. 1st. Chap. 3rd. sect. 9th.

The inference I draw from the above remarkable passage is, that the perfect geometrical figure, which I shall prove the Pyramid to be; it's commensurability of parts with the whole; the scientific approach of the side of it's base to a meridional degree of the circumference of the earth; and the useful solutions of problems deducible from it; bespeak it the production of those immediate descendants of Seth, and the faithful that adhered to them, distinguished in Holy Writ, by the appellation of the *sons of God*, as the rest were called the *children of men*.

And since the above recorded traditions retained by a society of people, who have so faithfully and diligently preserved and handed down, the sacred writings of the old Testament, are certainly both important and worthy of attention; there can be nothing either extravagant or unreasonable

* This quotation I have taken as I found it in Mr. King's *monumenta antiqua*, Vol 1. page 142.

unreasonable, in attributing this perfect production, insufficiently proved to be antediluvian, to the beneficent efforts of those sons of God, with a view to transmit to posterity, a magnificent paragon of the more useful parts, of the many scientific discoveries made in the early part of their long well spent lives.

And even independant of the authority of the traditional testimony above mentioned; what should impede our belief that these antediluvians, dignified in Holy Scripture with such a distinguishing appellation, were men of natural good parts, and that amongst them, should have been found some men of surpassing talents; men of refined taste, skill, judgment, and every mental endowment; since they were so immediately descended from him, who, in receiving his existence, received, at the same time, maturity of knowledge, to an extent equal surely, if not surpassing that of any of his immediate descendants: and this first of men lived long enough, to have been consulted, even by the very projectors of the design for promoting science by the invention, and erection of a specimen indicative of some of the more useful branches of geometrical discoveries, and which might also serve mankind, in ages then to come, as a perpetual and permanent metrical standard, for the various well known purposes of human life.

What is there, I repeat it, what, either extravagant or unreasonable, in believing those antediluvian fathers, those sons of God, to have been the fosterers of science, the promoters of the arts, and the accomplisners of the means to give perpetuity to useful discoveries, after maturity of age enabled them progressively to bring to light, the secrets of the arts and sciences, the seeds whereof they inherited, from their, and our grandest Sire?

H

Shall

Shall we extol the wisdom of a Plato, the ethics of a Socrates, the theorems of a Pythagoras; admire the ingenious mechanic inventions of an Archimedes, the mathematical improvements of a Van Culen and a Newton; and refuse to allow such excellent endowments of mind, to be a participation of similar talents, bestowed by Heaven on those Sons of God? Shall we say that the memorial of traditions, which flowed from a wisdom and knowledge inspired into the human mind, at first, not by a superstitiously deified Minerva, but by the eternal living God, was less promptly embraced, less assiduously cultivated by antediluvian favorites of the sciences; than the diminished portions of it were, in after ages, by men, whose lives were contracted within the span of a century; and whose mental faculties were more or less narrowed, by the first impressions of superstition and vice? Why set bounds, then, to our ideas of the consequent superexcellence of antediluvian paragons, and not rather exult that, at least, one useful specimen of them, the Pyramid in question, remains to us out of the general wreck of many others by the deluge?

It is very apparent, this Pyramid, either by the deluge, or some other agency, has suffered dilapidation, as before observed; and has been stripped of it's former coat; and now exhibits to view the coarse gradations of rough stones of an enormous size, which have struck Pliny, and other visitors with amazement, at the contemplation of such ponderous magnitudes, elevated to so great a height. Now without running into the absurd supposition, some have indulged in, concerning Adam's lofty stature; we know from Scripture, some of the antediluvian descendants of Adam were giants; the offspring, indeed, of the sons of God, by their marriages

marriages with the daughters of men : yet it can scarce be imagined, that the analogy between those giants and their fathers, was so disproportionate, as to admit of either parent being of the common stature of men after the deluge ; surely the immediate descendants of Seth and Enos, were of larger stature than we are. This once admitted, the inference is not unreasonable, that the management of these gigantic stones, so large and ponderous in their mountain-like collection, as to withstand the impetuosity of the waters of the deluge, was attended with less difficulty, in the hands of those builders, than stones of half the size, would be in the hands of our masons. And though neither of these suppositions obtains in the idea of such stones, being raised by the naked hands ; the advantage of stature, and of course, proportionate strength, must be allowed very great in dressing, or hewing, or in working assistant engines, such as the jack amongst us.

By common rollers and levers, the largest of those stones might easily be conveyed to the foot of the Pyramid : the elevation, therefore, is all that excites wonder : and without incumbering the discussion of this achievement, with Mr. King's notion of sloping banks &c. (Munimenta Antiqua Vol 1, p. 264), by means of the simple instruments, called jacks, applied to the ends of each stone, and worked by men of greater strength, than men have in these days, they might easily be raised to about 4 or 4½ feet of height, the greatest elevation any stone, in the pile, would require ; for, the ground-course being laid, each stone, for the next course, by these jacks, might be raised, till the bottom of it was as high, as the top of the ground course ; and then by rollers and strong levers with machines, which are easily

easily contrived for suspending, at so small an height, in each repeated effort, the stone raised by the jacks, however ponderous and large, when suspended, might most easily be conducted to it's bedding : and this suspending implement may be very simple in it's construction, nothing more than two pieces of timber, with a head, at their junction at top, on the principle of the head of the king post, in a trussed roof ; which head, if made of iron, with shoulders, (as in roof) to receive the ends of the timbers at right angles, would be equal to the suspending any weight, (connected to it by a chain of sufficient strength,) that can be embraced in the space it extends from one leg to the other, Whereas a machine, to suspend and elevate, at the same time, is of a complex nature, acting by pulleys and windlasses &c : necessary indeed for raising to greater heights, than can be reached by jacks.

Thus might these stones have been piled from course to course, rollers and levers might have conveyed them to the foot of the Pyramid, jacks and suspenders might have raised them up gradually from one finished course to another, till the whole were completed. And, however defective this my description may be, I doubt not but it was, by some such process, this Pyramid was built. For what wonder is it, that, men much larger and stronger, than our workmen, should be able to work large jacks, to this effect ; when, even by common jacks, our men can raise the front of a house, when sunk from it's level ? And if Archimedes invented the means of raising ships out of the water ; why not extend the inventive faculty, to some of the ingenious antediluvians ? And if strength be an acquisition, in performing great exploits, certainly they had the advantage.

The

The scientific perfections of the great open Pyramid, which will be the subject of the ensuing chapter, bespeak it's Founders men of virtuous pursuits; men, who, after receiving of Heaven, all necessary talents for astronomical and geometrical discoveries, commendably applied themselves to the most rational and probable means, in their power, of extending, by a scientific specimen, as much of that knowledge, as possible, to generations, then to come; in order that their posterity, like their progenitors, might by laudible exertions, transmit to after ages, not only the Divine consolatory tradition of the revealed promise of Redemption, but also the memorials of those principles, from which, both easy and certain deductions might be drawn, for the two-fold purpose, of utility and delight; the two great springs of social establishments. Of this character is, and was by them intended to be, the grand Pyramid of Giza.

But by no means can the same be said of the other Pyramids in it's vicinity: which, as before mentioned, are doubtless antediluvian also, and from their more entire state of preservation appear to have been erected much nearer to the time of the deluge. But it appears not that the founders of them had any such laudable design of transmitting to posterity, scientific specimens. First, because the component lines of their dimensions are not commensurate, as in the great Pyramid. Secondly, because they have no open access to the interior, of course no standard commensurate with the external length of base or other lines; and hence they appear to have been erected for no geometrical purpose; and indicate their founders to have been some of those, who, after their intermarriages with the daughters of men, became, not only degenerate despisers of useful knowledge

ledge, but altogether abandoned to luxury ; intent constantly, not on profiting Society in ages to come, but on evil, in all kind of extravagance, pomp and vanity ; and apparently built the Pyramids, now in question, merely for ostentation ; instigated, perhaps, by the urgent entreaties of the vain females, who swayed and overruled the faint efforts of expiring virtue in the breasts of the husbands of their new alliance. Hence, probably, the tradition of this female influence, as having occasioned the building of such immense piles, circulated by the Noachidæ, some time after the flood, and imperfectly comprehended by their offspring, at length was received as the history of the Pyramids, both as to their founders as well as to their end, and thence might easily be encumbered with a variety of accounts of men and of purposes, that never existed ; till at length the Egyptians, who inhabited that region, after the dispersion of the more immediate descendants of Noah, gave into all the previous spurious relations ; and thus at last were invented, partly by the priests, and partly by the other inhabitants, the fabulous stories of a Cheops, a Rhodope and others, as the founders of the Pyramids, and for the purposes of sepulchral monuments. Whether the successors of those Egyptian priests, who gave Herodotus his information, believed such fables, it is hard to say : but that men of letters, in these inquisitive times, should have subscribed to the opinion of any of those most ancient Pyramids being erected for a sepulchre is altogether unaccountable : especially under the persuasion of the erection being posterior to the deluge ; since the life of man after the deluge, from the age of maturity to his dissolution, was but a sufficient term of years, for the erection of any one of the three great
Pyramids

Pyramids ; and fond indeed must that Prince have been of the thought of death, who could spend his revenue, and all the years of his reign, in preparing his own tomb!!!



CHAPTER V.

OF THE COMMENSURABILITY AND SCIENTIFIC PURPOSE OF THE GREAT PYRAMID.

THE plan of this Pyramid is acknowledged to be geometrical square, whereof the side is, at last, (after having been reported in as many different dimensions, & there have been visitors) ascertained by the French mathematicians, while lately in Egypt, to be equal to 30 cubits of Cairo, or the great Egyptian stadium. They very reasonably concluded, that dimensions taken on an adventitious surface liable to incessant variation, and never on a settled level on every side, must be, however exactly measured, at any stated period, altogether nugatory and useless. And suspecting that the original design of this astonishing pile, was intended, not for sepulchral purposes, but for a much greater and more beneficial service to mankind: caused the adventurous sand and rubbish to be dug out at the corners, in search of the commencement of acclination of the sides, and by these means discovered the true dimensions of a side of the base. Which might, after such a discovery the real foundation at the corners, be easily ascertained with any exactness; either by erecting perpendiculars at the very extremities of two corners, and measuring the distance from one to the other; or by a plumb-line justed at the end of the measuring rod, and let fall to the point of the corner in the trench: and they have thus explored

explored the length, and are said to have found it to be equal to the great Egyptian stadium = 400 cubits of Cairo: and they report, that the inclosed excavated chest, in the upper chamber, cut out of one hard granite block, is in length, (as ascertained by Mr. Greaves, and by some other visitors of this chamber,) 4 cubits exactly; they (it is said) also report it to be one hundredth part of the side of the base of the Pyramid: and these French Savants also give it as their belief, that the excavation of this chest was originally intended by the founders, not for the repository of a corpse, as has been the prevalent, but truly ridiculous opinion, but for a standard measure of capacity; in like manner, as the length was a standard of linear measure. And

From this opinion of the French literati, surely ~~any~~ intelligent observer, well read on the subject of ~~the~~ Pyramids, can possibly dissent. For who can entertain the belief, that the discovered real length of ~~the~~ base, happened accidentally to be just 100 times ~~the~~ length of the Chest? And since this Chest must ~~have~~ been deposited where it is, at the building of the Pyramid; for it is known to all, who have crept through the ~~stair~~ tened long passage between immense blocks of granite, and passed long descending and ascending galleries, to visit the Chest furnished chamber; I say to these it is known to be equally impossible to introduce such a Chest after the Pyramid was finished, as it is now to purloin it, in an intire state: and the same reasoning obtains as to the supposed lid, of which some people have dreamed, but which in fact never existed. Since, I say, this curious Chest was there deposited by the architect himself, he certainly knew it to be commensurate, in it's length, with the side of the external foundations

indations, and did, no doubt, so design it, for metrical purposes, both by it's precise length, as well as by it's capacity: and contrived the access to it, so far difficult and unpleasant, as to be no inducement to any, but those who had some interesting decision in view, to frequent its abode.

And although the extreme hardness of the granite, which the Chest is made, seems, at present, to argue such precaution unnecessary; since the savage attempts of the Arabs and others, to deface it with iron tools, have never succeeded; yet, it must not be forgot, the ancients had a secret, which is now generally, at least, unknown, mollifying such parts, as were intended to be cut away, even in the hardest porphyries, leaving the other parts in their pristine state. Mr. King, in his note on this subject, (*Munimenta Antiqua*, Vol 1, p. 124) says, he is informed by Doctor Mayes, a learned chemist, of the discovery of a certain preparation of lead rubbed with a blunt iron tool, that will presently wear away the hardest granite, or even basalt: and Mr. King thinks the 18th and 24th verses of the 19th Chap. of Job, are some allusion to this method: in the English version his observation obtains: the Vulgate, however, does not so well favor the idea.

In passing now to the further consideration of the immensurability of the component parts of this Pyramid with the whole, I must incidentally observe, that although the denominations of a foot, a cubit, an aroura, a plethron, or acre, &c. are assumptions of adequate divisions of some of the lines, or of some of the areas of this paragon: it does not follow that the antediluvian founders of it had in view assumptions of the very same portions of lines and areas, much less similar denominations

tions for any determinate portions, which they adopted, for uses peculiar to their state and to all we are certain of in that regard is, their attention to commensurability, from which, by adequate division and subdivision, a part might be a for any metrical purpose, always referable to some division, or to the whole.

The denomination cubit, (as we term it assumption of an adequate portion, whereof the name is unknown: the foot is also an adequate clearly traced up to the Egyptians, before the era of the colony under Cecrops, and even the denon itself is deduced from the ancient Greeks; as al droua, and the plethron.

But to proceed to the proofs of this perfect in this happy, pleasant, useful commensurability Pyramid of Giza: which, I shall, to avoid any measure by the denomination of cubits: (the measures of which the reader may reduce to feet by 1.834 when the number of feet only is to be ascertained: which multiplied by 12 is rec in.21.888 = ft.1, in.0.888;) yet, in such dimensions are to be proved by inferences, they will be reduced from cubits to pyramidal, and also to English and vice versa.

That the base or plan of this Pyramid is a trical square, and that the side thereof measures cubits; also that the granite Chest, (heretofore grossly called sarcophagus) is four cubits in length is contained in a side of the square base, just 10 are incontrovertibly ascertained. The question

What is the vertical height of the Pyramid from the centre of the square base to the apex perpendicular

perpendicularly over the centre of the base or area, when the flat at top is imagined to be perfectly pyramidal, by the continuation of the four triangular sides, until they terminate in a point, which will be called, in this discussion, the apex of the Pyramid?

The latest account of the admeasurement of the Pyramid by the French, that has fallen to my lot to peruse, is that given by Sir Robert Wilson, who, more like the historian than the amateur, amuses his readers, by giving them an unrestrained free sketch of that object, which engrossed the scientific attention and scrutiny of the French Savants: and to assist his reader's memory, as it should seem, he reports the result of *their* studious calculations and accurate measurements, in familiar round numbers, saying,

"The height of the largest Pyramid is, at last, definitively ascertained by the French to be 600 feet, the length of it's base 700 feet." I presume he means French feet: but whether French or English feet, the inaccuracy of the statement is evident from the experiment of the enclosed Chest, measured by several learned men, who agree in their statements of it's length, viz, equal 4 cubits of Cairo; and from the French themselves we learn, that it is one hundredth part of the length of the base: which length, in English feet, is 729.6; and this reduced to French pied de Roy, or Paris feet, is 683.146 &c. Hence is seen that the round number 700 feet, whether French or English, accords not with the ascertained true measure of the length. And it is fair to conclude, that the round number 600 feet of height, is quite as incorrect for the true height, as the 700 are for the true length.

Now to assume the 600 as French feet, which is most probably intended by Sir Robert, and reduce them

to English, they will produce 640.8 for the height; and 700 French, produce 747.6 English feet for the length. If then we suppose Sir Robert's recorded height too much for the true height, in the same proportion as his recorded length, is found too much for the true length; the statement then is thus, as 747.6 : 729.6 :: 640.8 : 625.3714 &c. for the height by Sir Robert's statements, corrected by the true dimension of the length of the Pyramid's base. But as this height of 625 &c. feet English, merely the inference of a corrected statement, may not be so satisfactory as to exclude all doubt; it will serve, however, to prove the much greater inaccuracies in the various recorded heights, by other authors, of whom none has asserted above 500 English feet, as the vertical altitude. We are now to consider also this height inferred from Sir Robert's record, corrected by an indisputable criterion; is only from the centre of the base to the centre of the flat at top, which, whatever it's real sides may be, will certainly add something to the above inferred altitude. 625 &c. English feet; and with this addition, the height will be found to approach so very near to the dimension which I shall prove, will constitute the perfection of the ancient geometrical paragon; as to leave no room for hesitation even, in deciding, *that*, and no *other*, is the true vertical height, when the sides of the Pyramid are, or are imagined to be, carried up to an apex.

First, then, the triangular sides of the Pyramid are now ascertained to be isosceles trigons, whereof each has for it's base, the length of the Pyramid's base; assuming, then, for the perpendicular of this triangle, the whole length of it's base; that is for the shortest possible line from the verticle angle, to the side of the base, which of necessity falls on the said side of the base at right angles

s with it, dividing it into two equal parts : secondly, evident that, from the point in the side of the base in the perpendicular touches and divides it, to the centre of the square that forms the area of the plan of the pyramid, is a length equal to half of the side of the base, and the termination of this length, meets the line, when as let down, inside of the Pyramid from it's top to the centre of the area, at right angles with it. Now imagine a right angled trigon, one leg whereof shall be the known line equal to half the side of the pyramid's base, i. e. 200 cubits; the other leg the altitude of the Pyramid sought, which I shall call A, and the hypotenuse is the perpendicular, of the isosceles first mentioned; then by Pythagoras's theorem, if we subtract the square of 200 cubits, equal to the short leg, from the square of 400 cubits, equal to the hypotenuse, the square root of the remainder must be the other leg, or the real vertical height of the Pyramid.

Accordingly, from $400 \text{ cubits} \times 400 = 160\,000$, take 40,000, the product of 200×200 , and there will remain 120,000, whereof the square root is 346.41016151376, the true vertical altitude sought; which reduced into English feet, are equal to 631.8521346.—This is equal to 625 when increased by the altitude of the top wanting, that it must be an unreasonable sceptic can doubt any longer of the sides of the Pyramid being isosceles trigons, whereof the perpendiculars are, were intended by the architects of the Pyramid to be the whole length of the base : since the altitude they receive by the vertical junction at top, is so conformable to the height recorded by the French literati, and by others, when due allowance is made for the depth had not taken into their account. For

Pliny

Pliny who calculated the dimensions upon the adventitious surface, at a time when the sands must have been deeper than now, for reasons before assigned, records the line, which is the perpendicular of the trigon or side, at 906 pyramidal feet (whereof 2½ are the cubit,) or as he states the measure 883 to the flat at top, and 25 more of this inclining line, to reach an apex : and as the base, to which this line is found to be equal, is 1000 such feet, of course the depth of sand, admitting his dimensions to be accurate, must have been, according to the vertical altitude now discovered, 31.8 cubits = 58 English feet.

Pliny also informs us, that the largest Pyramid occupied eight acres of surface. And it will be presently proved, that this assertion is perfectly correct : it is, however, rather surprizing, whence he inferred it. For it appears by a comparison of dimensions above stated, and his own 906 pyramidal feet equal 662 of ours, that the square of these by no means contains eight Egyptian acres, as will presently be seen : he probably founded his assertion on some very ancient annals in some of the old authors he frequently quotes : and that author again must have received it as a very remote tradition. My reasons for this conclusion will appear in the sequel.

It is asserted in (I believe) Doctor Arbuthnot's tables, that the learned are not all of the same opinion, as to the quantity of area, which the Greeks called plethron ; and in reality, it seems a thing impossible to be defined, as an abstract precise quantity, any more, than the arpent, in some of the French provinces ; or our acre, which varies in different counties ; because the acre is comprized of a settled number of perches, but the perch of one county is not always the same as in another.

And

And even the term acre, amongst *our* ancestors, was not always, nay scarce ever, restrained to a precise measure of area, but was assumed vaguely to signify any inclosure, or distinguished piece of ground ; such as we now call lawn, croft, or field ; and in common uninclosed tracts, shared amongst several proprietors, the arable portions, formerly called acres by computation, our farmers call lands, as two lands, three lands &c. All such appellations of vague computed quantities, were formerly in common with us and all nations on the Earth, until determinate measures, and methods of applying them to areas of land, were invented and practised.

Many centuries, no doubt, passed by, after the confusion of tongues at the tower of Babel, and consequent dispersion of the more remote descendants of Noah, before mankind could even settle their languages, much less invent practical methods, by settled instrumental measures, for proportioning and adjusting their lands. They, however, who settled in those regions where the Pyramid, in question, exists, and in process of time were called Egyptians, from some chief or other whose origin can only be traced up to fabulous traditions, but who must have been no very remote relative to the immediate descendants of the Noachides ; they, I say, were very likely to remember the tradition of this paragon being a standard, whence determinate quantities of measure might be assumed. Nor can we reasonably doubt but some amongst them were prompted by the same curiosity as tempted our moderns ; to make their way to the Chamber, where the useful abridged copy of centesimal measures would be found, i. e. the granite Chest.

We read of the very early notion the ancients conceived of centesmas ; and from such impressions on their minds

minds, and probably, from a tradition of a custom, amongst their ancestors, of retaining specimens of an hundredth part of large quantities, as some criterion whereby to know their own, from the lands adjoining; it might from a familiarity with these centesms, easily occur to them, that this deposite of an oblong Chest, was the centesimal part of the length on the outside. But, to wave these conjectures, not, I conceive, wholly improbable, certain we are, that the Saites, or Saitæ, who emigrated from Egypt to settle at Cecropia, brought with them specimens of linear measure perfectly commensurate with the length of the Chest in question, and by it determined the precise front line of their dedication to Minerva, called by them, or by their descendants, prior to the destruction of it by Xerxes, parthenon and hecatompedon. Whence it is clearly proved, by that ancient front, exactly ten times the length of the Chest, that either the first founders of the temple divided the specimen copy of the Chest into ten parts for the measure of ten feet; or their posterity divided the said front line into an 100 parts, for the same purpose : in either case, the Chest is proved to have been the original standard, from which the greater part of the ancient postdeluvian world, derived their foot measure; as shewn in this treatise above Chap. 3rd, and elsewhere passim. To return, then,

The Greek plethron can mean only a vague extent of land, when explained according to the import of the term : it is made up of the double aroura, as acre with us is constituted by a fixed number of perches, which perch, in a length determined by law, is in general use ; yet in some places a different size of perch still prevails ; of course the acre in such places is of various extent.

And

And the very same must have been the condition of the ancient plethron of the Greeks, since it was always the double aroura, and aroura means, in itself, nothing more than an arable field, or a piece of tillage; from the radix *αρουρα*, i. e. to plough. The ancient Romans hence took an hint, and determined their acre, called *jugerum*, by the quantity a yoke of oxen could plough in a day, or at one yoking, as our farmers call it; and though the Romans settled the measure afterwards by the foot; what could be more vague or less scientific, than to seek determinable quantities from such origins? If it be asked

Whether the ancient Greeks had the same recourse to oxen, instead of a scientific and permanent origin, when they restrained the vague term aroura to a specific extent of area? I answer, on the authority of Doctor Arbuthnot, in the negative. But at the same time it appears not, in the table before me, (said to be copied from the Doctor's tables), what standard they consulted; for the table records two opinions concerning the measure of the Greek aroura; one asserts 722 square feet for the aroura, and the double thereof 1444 square feet for the plethron: the other opinion assigns 5000 square feet to the aroura, and 10 000 to the plethron. Which ever of these opinions be adopted, it must be the modern to which it refers, not the ancient Greeks; for their immediate ancestors, the emigrants from Egypt, no doubt, would have perpetuated the Egyptian aroura for the $\frac{1}{2}$ plethron, as they did the length of the Chest for their standard of linear measures of feet and cubits. And

The same tables state the Egyptian aroura as the square of 100 cubits=10 000 square cubits, of course the plethron of the ancient Egyptians, was 20 000 square cubits, by whatever name they called it. Phiny, by a

synonymous word in his language, calls them jugera, and says the largest Pyramid occupied eight of them, which produce an area of 160 000 square cubits. And the discovered dimensions prove this assertion perfectly correct, as I before observed. For

The side of the base of the Pyramid being 400 cubits, these multiplied by 400, produce 160 000 square cubits. Nor is this the only useful and pleasant coincidence, amongst the parts of the Pyramid; for each of it's acclining sides is a trigon, whereof the perpendicular, as before proved, is equal to the base, and of course the area of each triangular side is, 80 000 square cubits, exactly equal to half the area of the Pyramids ground plan: which ground plan contains 8 acres or plethra, and these contain 16 arouras: so each side is equal to 4 acres, or 8 arouras. And the sum of the four triangular sides, is equal to the area of the square of the diagonal of the plan = 320 000 square cubits, which are equal to 16 acres.

How early the inhabitants of that region, after the deluge, assumed for a square of land in the precise measure, which they, or rather the Greeks for them, called (*μεγαρα*) is uncertain; but at whatever time such a square first obtained, there can be no doubt of it's having been determined from the pyramidic standard; since it is so perfectly commensurate, both with the granite Chest, which, 25 times repeated, terminates a length, whereof the square is the aroura, or 10 000 square cubits: and consequently the aroura is commensurate with, and adequately divides, either a triangular side, or the geometrically square plan, containing 160 000 square cubits. And no man can pretend, that so perfect a commensurability could have happened by accident. Should it be said

said, that the acknowledged predilection for centesms, amongst the ancients, might prompt them to assume 100 cubits for the length of the side of their aroura ; let this be admitted, for a moment, then it proves the cubit itself must have been previously determined in the precise length of the 4th part of the granite Chest, either by those land measurers themselves or by their ancestors; and the commensurability is still irrefragably proved and established.

Also the square of the diagonal of the geometrical square base of the Pyramid, being just equal to 320 000 square cubits, illustrates the famous demonstration of Archimedes, being a number evidently equal to twice the area of the square plan of the Pyramid, yet not attainable in any arithmetical operation by numbers. For 565.6853365608 the root, sufficiently near for any practical purpose, has still a remainder, and would have continually, were the operation to be carried on to the end of time itself. And truth here is only to be demonstrated by this geometrical scholion, or by algebra.

Thus has been proved and established the commensurability of this ancient perfect paragon; it's utility as a standard of capacity and linear measures clearly ascertained ; it's perpetuated basis discerned, on which theorems are grounded for the solution of several trigonometrical and other geometrical problems, both useful and pleasing. And whether the reasons adduced in this treatise to prove the antediluvian origin of the Pyramid, be admitted or not, all the advantageous properties productive of so many objects of utility and rational amusement, must equally be acknowledged by his and succeeding ages.

And no doubt the antediluvian patriarchs, who were, I am convinced, the projectors of this grand scientific pile, well understood all the useful deductions liable to be

be drawn from it's harmonious construction, whatever might be the subordinate and proportionate quantities, which they assumed, from divisions of it's parts, for their practical purposes.

In concluding this discussion, I declare, that I most cheerfully submit to the criticism of the learned, and should they deem it worth their attention, as truth is the object of my research, a fair and candid refutation of any thing I have advanced, will rather gratify my avidity in this pursuit, than excite my resentment.



CHAPTER VI.

OF THE ACCURACY IN THE DIMENSIONS OF THE EPHESIAN TEMPLE, BY PLINY.

WHEN this renowned temple at Ephesus was visited by Pliny, he was so struck at the majesty of it, as to proclaim it the wonder of all Grecian magnificence: he measured it, and no doubt with a precision equal to the merit of so beautiful an object, and records it's dimensions, in the same Book 36, Chap. 14, in which he expresses his admiration. The front 220 feet; the length 425 feet; the shaft of the column (in one piece) 60 feet; the number of columns 127. And in Chap. 23 *ibid*, he says the height of the column, when it had received it's base and capital, was equal to $\frac{1}{3}$ of the front of the temple (of course 73 feet and 4 inches). These are all the dimensions we gather from Pliny. But for it's architectural character and symmetrical dimensions, we must consult Vitruvius, who gives but a sparing account of them, by citing this temple as an exemplar of a previous verbal description.

Vitruvius, then, Book the 3, Chap. 1, cites the
Ephesian

Ephesian Diana as a complete example of an Octastyle diptere, the character of which he teaches to be a temple having 8 columns in front, 8 in the postern front, and 15 on each side, reckoning the angular columns twice : but to prevent any misconception of the number of columns, (on which the conclusion of the ensuing discussion much depends), it must be observed, the number in the outward ranges of columns, in an octastyle diptere, is 42 : the ranges between them and the walls contain 34 columns, and between the ends of the side walls, in front, are to stand 2 columns to supply the place of an end wall, and, in hypethres, alike 2 are to have place in the postern front, and these taken into the account of the second ranges of 34, make 38. And this I recommend to be *particularly remarked*. The whole number of columns, therefore, on the outside of the walls, and which are all of the same diameter, in an hypethre octastyle diptere, is 80 ; but if not hypethre, only 78. And this leaves, of Pliny's recorded 127 columns, about which there has been much controversy, but which I will prove, in the sequel, to be perfectly correct; leaves, I say 47, if hypethre, and 49, if not, to be disposed within the walls.

The diameter of the column and the species of intercolumniation omitted by Pliny, we are taught to find, by Vitruvius, in any character of temple, and in any species of intercolumns, of which there are 5 ; but the species, which will be presently known to belong to this temple, is that called systyle, defined by Vitruvius to be of 2 diameters between the shafts of the columns, immediately above the bases : which base projects according to Vitruvius) beyond the shafts, a $\frac{1}{4}$ of a diameter ; i. e. the extent of the plinth of the base is

$1\frac{1}{2}$ diameter. Then the sum of the diameters of the columns and intercolumns, with $\frac{1}{2}$ a diameter for the two projectures of the angular bases, in an octastyle, in systyle intercolumniation, is $22\frac{1}{2}$, and by it, is to be divided the 220 feet of front, and the quotient is ft.9 in.9.25, the true diameter of the column in this temple.

Now if the dimension of the side 425 feet, be commensurate with the front 220, the same method is to be taken to obtain a divisor, i. e. 15 columns have 15 diameters, 14 intercolumns, at 2 each, equal to 28 diameters, and projectures $\frac{1}{2}$ a diameter, the sum of these is $43\frac{1}{2}$, by which divide 425, the quotient will also be ft. 9. in.9.24. Thus is seen that the coincidence is perfect within an 100th part of an inch: By which is demonstrated not only the accuracy of Pliny's dimensions of breadth and length of the Temple, but also that in his given length of 425 feet, there could be no more nor less, than 15 columns inclusive of the angular columns at the ends. Nor will there be a coincidence, between the diameters, by divisions of breadth and length, in any other species of intercolumns; and Vitruvius teaches that systyle is the species for ionic columns, and in this Temple the columns were ionic.

The inference I draw from these incontrovertible premises is, that the foot measure by which Pliny records the dimensions of this Temple, could not be either a foot of the size of ours, or of that of the Roman (taken from the monument of Cossutius,) which is to ours as 967 to 1000; because a diameter of column, of ft.9, in.9 $\frac{1}{2}$, if of the said Roman feet ft.9, in.5 $\frac{1}{2}$ $\frac{1}{2}$ of ours, is considerably larger even than that of the surprizing column near Alexandria, called Pompey's pillar, whereof the
diameter

is now exactly known to be only ft.8, in.10½ of measure, about 7 inches less than the diameter $\frac{1}{5}$.

Though some years back I discovered the perfect comparability between the 220 feet in front and the length, as stated by Pliny, with 8 columns in front the side, as taught by Vitruvius, in that kind of intercolumniation called systyle; yet bewildered by the practicability of disposing even 100 columns in a temple with only 15 on the side; and conceiving, as I thought this octastyle diptere could not be an hypethros truck also at so uncommon a size of diameter it, concluding, with others, the foot Pliny gave the Roman Cossutian; I could not possibly reach any other conclusion than of the dimensions, as to the length, being incorrect; from the impossibility of disposing even the 100 columns, suggested by Mr. Windham instead of 127, in a diptere temple with one pronaos. After repeated essays, I found that the intercolumniation would best fall in with the plan of 100 columns, would perfectly conform to an old rule of giving, as nearly as possible, twice the length to the length to the finished temple, and require a somewhat less diameter. And as this requires 16 columns on the side to quadrate with the old rule, instead of 15, as in other species of temples, the length 425 feet stated by Pliny would be retracted to ft.442, in.2.4.

The plan ordained and disposed in 100 columns, according to Mr. Windham's and Faulkner's correction of 127,* I sent to the Editor of the Gent. Maga-

zine

* Mr. Windham imagined 100 columns was the meaning of 127 in Pliny's work. And Mr. King in *munimenta antiq.* corrected Mr. Windham.

zine, who honored it with a plate, in supplement to the Mag. for the year 1802. Which, though circumstanced as I was then, I took much pains to prove feasible: I am now under the necessity of retracting, and of sacrificing my then labours at the shrine of truth. For,

Since the above concerted plan was published, I have discovered, on the authority of the Rev. Fred. Barlow, that several fragments of the columns were surveyed and the true diameter, by them ascertained, as already fully treated of in Chap. 3, to which I beg leave to refer the reader.

To return, then, to the further consideration of the character of this Temple, which Vitruvius cites, not as a subject of disquisition, but merely to exemplify his previous description of a double winged disposition called dipteros. But when he comes to the hypethros, he says, he has 10 columns in front, has the same number in postern front, two ranges, one within the other, all round; on the side 19 columns in the outer row, and 17 (of course) in the row next to the walls, which walls are so situated, as to have their ends opposite to, not the fourth, as in octastyle dipteres, but to the sixth column, right and left, causing the width between the walls within the Temple, to be equal to 4 columns and 5 intercolumns; has it's cell in the middle, with an access to its folding doors along the pronaos at each end; and, besides columns in the two pronai, has also columns (of similar diameters) all round the cell, in the manner of peristyles, at a distance from the walls of the cell, which in the area, thus surrounded by columns double in altitude, is open to the sky, the double columns rising to receive the roof that covers the walks all round.

From

From this description of an hypethre. (which may be relied on as the sense of Vitruvius, as far as it goes,) it is very apparent the reason of assigning so great a width to the inside is, to gain a proper space between the peristyle columns and the walls encompassing the cell, and not to contract the open area, wherein the statue was placed. And the reason of 10 columns in front and postico, instead of 8, as in the diptere, was merely for magnificence: because with only 8, there could not be double rows, without either enlarging the intercolumns, at least, to systyle, i. e. 2 diameters between the columns; or narrowing the inside area too much for the purposes mentioned. For, in temples of great magnificence, such as the Olympian at Athens; cited by Vitruvius, as an instance of an hypethre, though they had 10 columns in front, yet on account of their excessive diameters, the spaces between were deemed sufficient for two persons to pass arm in arm, even in intercolumns considerably less than pycnostyle, or $1\frac{1}{2}$ diameter: in fact, the intercolumns of the Olympian is something above 1 foot (our measure) less than pycnostyle; and the Parthenon (though octastyle) is cited by Vitruvius as an hypethre, and it's intercolumn is ft. 1, in. $3\frac{1}{2}$ less than pycnostyle: but it is proper here to remind the reader, that the Parthenon is periptere, that is has only 1 row of columns along the side.

This much premised, I do maintain that it is impossible to dispose, consistently with the received canon of symmetries, even 100 columns in an octastyle diptere, with only 15 columns in the length of the side, and with a covered cell disposed, at the postern end, as ordained by the canons of Vitruvius; much less to introduce 127 columns as recorded by Pliny, in and about *such* a Temple. The inference, therefore, is plain, and the alternative

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absolute,

absolute, that, all considerations notwithstanding, either the Ephesian octastyle diptere was also hypethre, or Pliny must have erred most egregiously in reporting 137 columns; and Mr. Windham's correction by restraining them to 100, is nugatory, unless he could have disposed that number in an octastyle diptere not hypethre; which no architect, conformably to the admitted documents of Vitruvius, can possibly perform, with only 15 columns on the side.

Influenced, therefore, as I am by the nice coincidence of the recovered diameters, by his recorded length of the Temple containing 15 columns, and his front line 8; I feel not disposed so far to question his attention and accuracy, as to imagine he could blunder so grossly in numbering the columns, as to record 137, where, unless the Temple were hypethre, not 100 could be found!

No other conclusion, then, can be reasonably made, than, that this magnificent Temple was in reality an hypethre. And the only objection that can be started against this conclusion is, that in an octastyle diptere, wherein the ends of the walls, right and left, embrace only 4 columns, all the extent between wall and wall, can only be equal to the diameters of 2 columns and 3 intercolumns, and this is deemed an insufficient width to admit of a peristyle cell.

This objection undoubtedly obtains, when directed against an octastyle diptere on a small scale, but architectural records inform us, that hypethres were always on very large scales, as the Olympian and Parthenon at Athens, and the Olympian at Elis. And the Ephesian Temple has been already proved to exceed the magnificence of the new Parthenon; and, in the diameter of
it's

it's columns, (the principal consideration in the present discussion,) to exceed both the Parthenon and Olympian also : and it's intercolumns so much more extended than in either of those Temples, as to render the width within, though only of 2 columns and 3 intercolumns, nearly equal to the internal width of the Parthenon ; though the said width, in that Temple, comprises 4 columns and 5 intercolumns for it's hypetral cell. And the Olympian Temple also has 4 columns and 5 intercolumns for the extent of the width in question.

Now to value this extent in feet and inches of our measure, it is only requisite to know the value of the diameter of the column, and the number of diameters in the intercolumns. And by comparing the said extent, in the Olympian and Parthenon, both known to be hypetare, with the extent (obtained by numbering and valuing the diameters contained) of the internal width in the Ephesian, a judgment may be formed of it's capacity, whether equal to the purposes of an hyphetral cell, or not.

In the grand Olympian at Athens, the diameter of the column is ascertained, by Mr. Stuart in his 2, Vol. to be ft.6, in.3, English, and the intercolumn ft.11, in.9.3; 4 diameters, then, = ft.25, and 5 intercolumns ft.58, in.10.5; the sum of these = ft.83, in.10.5, the width of the cell of this Temple, one of the wonders of the world for magnificence.

In the Parthenon, the width is given by Mr. Stuart in his plate 2, Vol. 2, Chap. 1, at ft.62, in.6.

And, in the Ephesian Temple, the diameter is now ascertained to be ft.7, in.1, 572355. Then 2 diameters = ft.14, in.3, 14571, and being systyle ft.14, in.3, 14571 is the intercolumn, which three times taken, is = to

ft.42, in.9.43713, which added to ft.14, in.3.14571 is=ft.57 and $\frac{1}{2}$ of an inch, for the width of the cell; which is only ft.5, in.5.42 less than the cell of the Parthenon: and when it is considered, that we read of no particular or extraordinary size of the statue in the Ephesian cell, comparable to the magnificent statue, by Phidias, in the Parthenon, the difference of ft.5, in the width of the cell of the Ephesian Temple, cannot be deemed an object sufficient to impede the admission of that Temple into the number and rank of hypethres.

Sir Geo. Wheler, who in the year 1676, visited Athens, discovered, in the Parthenon-cell, the columns mentioned by Vitruvius, in his description of the hypethros, as forming peristyle-porticos round the cell; and doubled in altitude; with the square area in the middle open to the sky: the Greek-Christians covered this area with a roof, when they converted this Parthenon into a christian church; but destroyed not those peristyle columns, which Sir Geo. says, supported galleries on the first range on each side, and over the entrance end of the cell; and this first range comprised, he says, 22 columns, and the range right over the first, had 23, the odd column standing over the entrance beneath.

This odd column, no doubt, had place over the grand entrance to the cell in the Ephesian Temple also, which certifies the accuracy of Pliny's record of 127 columns, which Mr. Windham, unable or unwilling to falsify the record, attempts to explain, as already noticed, by separating centum by a comma, from viginti septem, concluding there could not have been an odd column: and Mr. King, mistaking this correction, places the comma between viginti and septem. But both these corrections are superseded by the following ordination and disposition of the cell and two pronai, which both conform to the documents

documents of Vitruvius, and to the example, in Mr. Stuart's plate, of the hypethral cell of the Parthenon; due consideration being had to the difference in the size of the cells, that being 62 ft. wide and this only 57.

The ordination, then, which I suggest, is, that there be a passage or porticos on the four sides of the cell, (which is exactly in the middle of the Temple,) at a distance from the four walls of about 12 ft. 3 in: the columns, in the first range, shall be 7 on each side, 5 at the posticum end, and 4 at the end next to the front, reckoning the angular columns twice: i.e. the first peristyle range shall contain nineteen columns; and the range right over them, shall have twenty columns; which cause one to be over the principal entrance, omitted in the said entrance; in the first range, to afford a full view of the statue on opening the foldings: and four columns in each pronaos.

The disposition and symmetry shall be thus: the four columns in each pronaos, are to range, two and two, in rows with the two external columns, which, in equal intercolumns, stand between the ante at the ends of the external walls, and separate the pronaos, from the porticos without: the two columns between the ante aforesaid, are to be the same as the other external columns both in diameter and height; but the four columns, that range 2 and 2 between them and the cell's folding-door wall, are to be reduced in diameter by the ratio from nine to eight, retaining the same height as before; (by canons of Vitruvius;) their diameter will then be ft.6 in.4 and their three intercolumns, each ft.16 in.9 $\frac{1}{2}$: (Here, let it be observed, that with two columns, each in diameter ft.6 in.4 and three intercolumns each ft.16 in.9 $\frac{1}{2}$, a length is obtained of only ft.63, tho' the length from cells door wall

wall to the shaft of either of the two columns, between the ante, is ft.63 in.5, 83, because the in.5, 83 are about equal to the excess of the projecture of the plinths, under the 2 larger columns, compared with the plinths, under the reduced columns: by excluding the in.5.83, therefore, the three interplinths will be equal. And let not this caution be deemed immaterial.)

To proceed now to the cell; the seven columns on each side as ordained above, are to be in diameter ft.9 in.6, and they at the ends the same; the intercolumns every where in the circuit of these first ranges, to be systyle, i e ft.5, except the grand intercolumn at the front entrance into the cell, which is to be equal to 9 intercolumns and 1 diameter (on account of the suppressed column) = ft.12 in.6. And the distance between the shafts of the columns and the walls, on the sides ft.12, in.3.28; on the front and postern ends ft.12, in.4.85. And this disposition and symmetry of 7 columns on the side, and (reckoning the angulars over again) 5 in the postern end and 4 in the front end, will be found to require a length of cell equal to ft.72. in.3.7 in the clear; and a width as before established, of ft.57, in.4. The thickness of the front and postern walls of the cell, in which the foldings were placed, 4 feet to each wall.

The ratio here between the length and breadth of the cell approaches near to that established by Vitruvius, who ordered for the length, including one door wall, to have the breadth of the cell with the addition of a quarter of the said breadth = ft.71, in.3.7, the wall ft.4 subtracted, leaves ft.67, in.3.7, which taken from ft.72, in.3.7 leaves ft.5, and this I added to the length ordained by Vitruvius, in order to render the breadth of the peristyle walks all round the cell nearly equal; certainly a better disposition

disposition, than in the Parthenon cell, where there is near a foot difference; the side walk from the centre of column to wall being ft.19, in.11.5, and the end walk ft.12, in.11.65, in Mr. Stuart's plate.

Vitruvius in his description of the hypethros columns says nothing of their number, nor of their symmetry. But only that they are doubled in altitude, and at a distance from the walls, to form peristile walks like portico's. Much, therefore, is to be supplied by reason, and by proprieties elsewhere taught in his work. Reason tells us, that over the first range there was an epistyle with it's ornaments, to connect and stay the columns, and to serve as a ground, whereon the second range may stand. And these columns in the upper range, by a precept of Vitruvius, Book 5, Chap. 15, are ordered to be diminished by a quarter of the diameter of those beneath; this precept implies the necessity of an entablature, as it is called, between the 2 ranges; for, otherwise, if the upper column were but very little elevated from the top of the under one, the contraction of it's diameter, we may reasonably conclude, should be equal to the diameter of the top of the under column's shaft; that the eye tracing the tapering of the under column, from bottom to top, may perceive the regular continuation of it throughout the whole shaft in the upper column: but an entablature intervening and carrying the eye to a considerable altitude before it compares the contraction with that at top of under column, will feel no disappointment in the visual appearance of $\frac{1}{4}$ of a diameter. And Sir Henry Wotton's abstract criticism on this precept, is unfair and misapplied, when he, supposing no intervention, calls it a strange precept.

The rule however does not appear very definitive.

I, therefore, would make the contraction thus, ft.2, in.3, the diameter of the upper columns, in this case, and ft.2, in.6, the diameter of the under ones: and the symmetrical height of each, 10 diameters; which produce together ft.47, in.6; which, with an entablature between the ranges of ft.5, in.11,75, exactly equals the altitude of the columns in the pronaos, in front and postern front of the cell; which are ft.53, in.5.75 high. The symmetrical height of these, 7 diameters and an $\frac{1}{4}$: of the columns in the 2 pronai 8 diameters and 26 minutes: and in the cell, to be still more delicate, they are of 10 diameters in their symmetrical height.

The number, then, of all the columns, viz 39 in the cell; 8 in the two pronai; and 80 in the external circuit of the Temple, is exactly equal to Pliny's 127. A number which cannot be verified in any other *consistent* disposition of the hypetral cell. Not that I arrogantly pretend a more feasible ordination and symmetry cannot be devised; but only maintain, the above, or something very similar, must be admitted, to confirm the truth of the Temple's comprising 127 columns; and at the same time quadrate with the canons of Vitruvius universally admitted. And though the symmetry of the columns in the cell may be varied, I will venture to assert their disposition cannot.

This chapter shall be closed with a word or two in answer to two objections: the first, that it appears to be repugnant to reason and architectural propriety, to place a column, as in the above suggested disposition, in the centre of the postern end of the hypetral cell; since on the opening of the folding doors at the postern, it would seem to be in the way. To this I can only say that Sir Geo. Wheler and Doctor Spon bear me out, by recording

of such a disposition in the Parthenon: and
 umn in Pliny's account, is both a confirmation,
 ord, and at the same time an apology for the
 ve ordained and disposed.

lly, it may be said, that by rejecting Mr.
 s correction of Pliny's text, *columnæ centum*
tem a singulis regibus factæ, by placing a
 er centum, and making by this means the
 : 100 columns, 27 erected by so many kings;
 ve to find 127 kings instead of 27.

o say nothing of the impossibility of disposing
 columns, as demonstrated in page 83, nor to
 he improbability of finding 27 kings, who,
 l, are argued to have bestowed on this prince-
 ch of them only one column! I do maintain
 such meaning in Pliny's words. He had just
 the Temple was 220 years in building, though
 nccurred in completing the work. A succes-
 gs, in such a lapse of time, each concurring
 rest of Asia, towards this wonderful work,
 true sense of the passage. The quibble seems
 nded on the distorted meaning of the expres-
alis regibus, giving it the meaning of *totidem*
 if he had wrote *centum viginti septem singula*
regibus factæ: but as no such word follows
 ie rational sense is *by every king* who had
 ring 220 years. This sense will readily be
 lged, if the two expressions are taken together,
 a, a *singulis regibus*.

è I dismiss the subject, I must notice another
 expression arising from a false pointing in the
 says, after inserting the number of columns,
VI cœlatæ: uná a Scopâ. Which has been thus

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rendered

rendered: of these, 36 sculptured: one by Scopas. Now, what can exceed the absurdity of the supposition, that the renowned architect of the mausoleum, dedicated by a queen to the memory of her husband, should have undertook to flute merely one column of this celebrated Temple, in his native city? But let it pass so; then it follows, that of 127 columns, only 36 were fluted, the rest left plain: this indeed would have made the Temple a wonder to the world, but such a wonder, at which all the world must have laughed. After this, surely I need not say the true sense is, that 36 were, at once, (unà) undertaken and fluted by Scopas.



CHAPTER VII.

STRICTURES ON THE NEW FRENCH METRE, AND THE STANDARD OF THE PYRAMID PREFERABLE.

WHEN engaged in the four first chapters of this treatise I had in contemplation the subject of this; but apprehensive of bewildering myself, as well as my readers, with a confusion of ideas, by connecting the present subject with those discussions; I thought it more eligible to treat it after my remarks on the Ephesian temple, which, answering the purpose of an illustration of the foregoing chapters, I have here inserted, before I pass to the subject of the new French metre; with which I shall conclude my metrical discussions.

The rage for innovation, that, of late years, has overrun the continent, at length extended itself even to the serene abodes of the sciences, and prompted some of the French literati (to whom, for late scientific discoveries we are somewhat indebted) to dash at an attempt to change their national establishment of metrical quantities

titles: and in their place to introduce an invention marked with no other nor better character, than *innovation*! An invention fallacious in it's principle; and perplexing in it's end.

Mankind, no doubt, for many centuries past, have not known any practical means of tracing to an origin, the great variety of quantities established, under the same denomination, by different nations : as the Paris, the Roman, the Greek and the Berlin foot, and at least 100 others, all agreeing in the name, and all differing in quantity. The invention, therefore, of an original, stable, perpetual, and accessible standard, whereby to ascertain the original quantity that has obtained and perpetuated the name, *foot*, so universally, without preserving the reality, is, and has been for ages, a desideratum; or at least ought to be deemed desirable. But in truth, mankind for many centuries past, seem to have taken more pains in devising means, by various tables, of discovering the relations and bearings of one nation's measures with those of others ; than in attempting the discovery of their origin. And, probably, nothing I can write or say, will prevail on them to change their conduct; however much I may flatter myself with being able to prove the expediency of the change, and to point out the means.

I will proceed, however, to demonstrate that the French, from their invention, have still less grounds on which to realize such expectations. For let me ask, what is the discovery they have made? What the standard they recommend and vainly expect all nations to adopt? What the rare advantage and scientific boon their Countrymen are compelled by law to embrace? It is to forget, if they can, the commensurable divisions of their

own well known, and long established measures ; and the familiarity they had contracted with the reference they bear to those of foreign nations, and ancient, and modern authors ; and to apply themselves to the study of the intricate divisions of their new metre, which are incommensurate with the divisions of their own former measures, and with all other national measures and records in the world.

And this unsettling of the metrical habits of their own people is, after all, to establish and enforce by law, an uncertain and unattainable quantity for a standard, pretended to be derived from a natural exemplar, viz, the ten millionth part of the arch of 90 degrees ; or distance from the equator to the pole of the earth : which ten millionth is ascertained by law (but not by truth) to be ft.3.0794 of the ci d'avant pied de Roy, or in a lower expression of the fraction, ft.3, in.0, lines 11.4336. Now the basis of this precise quantity, is the pretended discovery of an exact meridional degree by Bouguer, taken in Peru in the latitude of about 25 degrees, deemed (but nobody knows why) so accurate as by law to require all other mathematicians, how learned, indefatigable and skilful soever, to acquiesce in Bouguer's pretended accuracy ; not excepting Borda himself, the father and promoter of the new metrical system, who had, with full as good pretence, set off with ft.3.0807 : but, it will be presently seen neither of these measures is the exact ten millionth part of the said arch ; first because they have imagined erroneously, that the degree in any latitude, is 90 times repeated in the arch, commencing at the equator and terminating at the pole : but though this arch comprehends 90 degrees, it is not true, that a degree experimentally taken in one latitude, will be found the same in

in a very distant latitude, even by the same essayers and with the same instruments. For the learned assert, and the experiments recorded prove the truth of the assertion that the degrees are known to increase in proportion as the experiment is made nearer to the pole. The truth of this will best appear by inspection of the following statements of recorded experiments, which I shall give as I find them, in French toises; the toise is 6 feet royal; Mr. Norwood's degree taken between London and York I reduce also to the toises; which he gave, of course, in English feet $367196 = 343816.4794$ French feet, by the proportion, 1068 to 1000

| LATITUDES. | TOISES. |
|--|-------------------|
| Peru 25° { The meridional degree by Bouguer - } | 57025.925925 &c. |
| In $45^{\circ}..31'$ { By the French mathematicians - - - } | 57048 |
| In $45^{\circ}..43'$ { By one experiment } 57050 by Borda { By another experiment } 57040 ment - - - - - | |
| { By the French academy, anno 1687 - - } | 57060 |
| In 52° { By Mr. Norwood, between London and York - - - - - } | 57302.7465666 &c. |
| And 200000 cubits of the Pyramid } = 56928.83895133 &c standard - - - - - } | |

By inspection of the above statements, which may be relied on, it is seen what a difference there is in the measure of a degree, when the experiment is made in the Peruvian latitude, and when in the latitude, between London and York. But as to the two experiments made in the same latitude, which I insert on the authority of the Professor Bygge, one would think it an
ophthalmic

ophthalmic error, or else a mistake of the pen-man; probably the last cypher was 9, and should be read 57049 instead of 57040; be it as it may, there is abundantly sufficient difference, to shew, that two experiments, made even in the very same latitudes, could not correspond with each other: and of course, the standard, adopted by the French, has no stability either from art or nature. Nor does there appear the least shadow of reason for preferring Bouguer's experiment, to Borda's, unless their object were to lessen their metre by a small part of a line, in which case, the degree, arising from the Pyramid standard, is preferable to either; for Borda makes the metre ft.3, in.0, lines 11.6208; Bouguer ft.3, in.0, lines 11.4336; the Pyramid ft.3, in.0, lines 10.6786565508; and here is almost a whole line or twelfth of an inch less than Borda's, and more than a line less than Bouguer's. And I have been at the pains of calculating their metre by the Pyramidic degree, to shew that the French, when determined to unsettle their established standard of the pied de Roy, and seek after another of natural stability, of which they expected all the world to be enamoured, have fairly exemplified the proverb, for they have let go the substance to catch at the shadow. The Pyramid offers a standard of such stability, as to withstand, through an incalculable length of time, the efforts even of violence; this standard would have been perfectly subservient to their design; and for permanency, no length of time within the verge of man's expectation, is likely, more in future, than in the past, to deprive the world of it's benefit.

But this standard in the Pyramid, so stable, so permanent, so perfectly adequate to metrical purposes, and withal, so accessible, especially to them, who so lately surveyed

surveyed it, they however embraced not; but entered into a maze of research, to discover in nature's cabinet, a more uncommon and curious principle, whereon to establish an immutable standard: and with what success we have seen in the above statements. And as often as experiments are made, either in Peru, or in any of the latitudes above inserted, some difference will doubtless be found; which, however immaterial in other respects, will tend to invalidate the authenticity of the new French metre, which, if ever it be extended to other nations, will, probably, in process of time, from other such new experiments, be changed and varied, as much as the value of nominal measures now are; since every essayer will naturally pay himself the compliment, of having measured and calculated with the utmost accuracy.

Nor have the French, even could they demonstrate, to their own satisfaction, the truth of such a discovery, any means in their power to perpetuate their standard, equal with the long existing granite chest in the Pyramid.

If, then, the subject of the preceding chapters, shall happen at some future period, to draw the attention of any who shall be disposed, from conviction of the inconveniencies arising from such discordant measures, to use the power in their hands to forward a reform, by establishing, not, like the French, an assumed arbitrary quantity, from a principle altogether fallacious and unstable; but such a metrical system, as may call men back to the primitive quantities of measures capable of being traced to that origin, whence the ancient Egyptians, the first Greeks, the ancient Romans and Corinthians, the Syracusians, Herodotus, Vitruvius, Pliny and

and, even at the present time, the architects of Rome, have received their foot measure.

And though this origin is in reality founded on a meridional degree discoverable, between the equator and 20 degrees of latitude, yet this circumstance gives no countenance to the French metre; first, because the founders of the Pyramid, after calculating their meridional degree, (which, by the way, they have done full as accurately as Bouguer, allowance made for difference of latitude,) they confined the standard, which they established on it, to an adequate portion of the measure of that degree, without exploring by it, the quarter circle of the earth. Whereas the French have, in vain attempted by the Peruvian degree, to ascertain the natural and true arch from the equator to the pole; to induce the world to believe, if they could, that their new metre is the ten millionth part of this natural arch: but as it is demonstrated, that the degree increases, in proportion as it is taken nearer to the pole; it is of course demonstrated also, that 90 of the Peruvian degrees fall very short of the measure of the natural arch: and of that smaller and vague arch only, their metre is the ten millionth part.

Secondly, because the pyramidal degree, whether accurately measured at first or not, has been for ages, and will be for ages to come, perpetuated by a stable, scientific, accessible and yet impregnable monument, and the wonder of the world: while the basis of the new French metre has not any intrinsic principle of stability, to ensure its perpetuity; and has neither reference to any other experimental degree on record, nor to any indisputable authority whatever, to prove its eligibility or even to recommend its admission except by the subjects

jects of France: who by law, have been compelled at present to receive it; until another Bouguer arrives with a different measure of a degree, which their rulers may like better: this reflection is not ill founded, for before the Peruvian degree arrived, Borda's metre was established, and was certainly preferable, being founded on an experiment made in the latitude between 45° and 46° .

But to return. If ever our Country shall be induced to explore and adopt the most ancient and first metrical system established in the world, since the deluge, it must be traced to the Egyptians, and from them to the Noachidæ, and will be ultimately discovered to have originated in that open Pyramid discussed in this treatise. It can neither be expected, nor indeed required, for this purpose, to ascertain any particulars of antediluvian date, beyond the demonstrated coincidence of the granite Chest with the external lines of the pyramid; a sufficient argument of such precision being for scientific and metrical purposes before the deluge, as it has been proved to have been in the æra immediately following; and now, by recent discoveries, holds up to us, as it has before, and not in vain, to so many ancient states and people, a most inviting specimen of metrical quantities.

The length of the granite Chest, therefore, might be received at least as the standard of linear measure; that length being 10 feet of the ancients, as proved in this treatise, and is the true standard of the Nilometre cubit, which is called the cubit of Cairo, and of which it contains exactly 4: and 4 such cubits are also the Scripture fathom, commonly called the fathom of the Hebrews. To which I shall have occasion to advert in the sequel of this tract.

The whole of the standard might be properly assumed for the 10 foot rod, the hand measure of that

denomination is well known amongst our builders : and this denomination might still be retained, and the lath, or rod, certainly more handy, as it would be shorter by rather more than a quarter of the present length. The other denominations also, of yard and foot, would be as perfectly congruous to the quantities to be established, as the present are : for most certain it is, that the pyramid foot is nearer to the average of the natural foot of man, than our 12 inches, of which it is 8.7552, or $8\frac{3}{4}$ full.

If the objection made, by the Professor Bygge, against the novel introduction of the French metrical system, should, by my readers, be extended to the pyramidal foot measure also ; that is, the inconvenience of collating a new measure with the old pied de roy, by which experiments, in various branches of the mathematics are calculated and recorded, in many excellent works published within these few centuries ; which, as the pied de roy is collated with the foot measure of other countries, by tables every where at hand, not only the French, but foreigners also may easily read ; which facility by the new metre is exchanged, even as to the French people, for a labyrinthic perplexity.

Certainly, the objection is fairly laid against the effects of the French metre ; but obtains not against the revival of the ancient metrical establishment, derived from an origin of such stability and antiquity, and whereof the circulation has been proved so universal for many ages after the deluge : every reader must surely, upon reflection, allow that the restoration of the standard of linear measures perpetuated by a paragon of such authority, has advantages both conspicuous and decisive, over the new metrical system in France, which
is

is neither commensurate with this, nor with the pied de roy, nor with any established foot whatever, nor even (as pretended) with the natural arch from the equator to the pole ; as demonstrated by the statement of meridional degrees above, chiefly measured by mathematicians of their own country: see page 95. And

Hence arises the validity of Professor Bygge's objection, viz, the difficulty, or rather the impossibility, of ascertaining quantities recorded in measures by the pied de roy, in exact relations to their metre, decimetre, centimetre &c ; in reality, however, although the Professor's objection militates forcibly against the new French metre, it prevails not to remove a previous inconvenience, had it even abolished the new metre ; and that is the pied de roy itself, in mathematical truth, is incommensurate with both the Pyramidic foot and cubit, and with every foot measure known ; a circumstance that confines the objection against the said metre, to French authors and records only.

Whereas the English foot is commensurate with every adequate division of the Pyramid's component lines. For though in tables of comparisons, a multiple is established, whereby to reduce French feet to English, and vice versa, by assuming that multiple as a measure, by which to divide English feet, for the equivalent in French : yet this cannot be done to mathematical exactness : for in the year 1687, the French academy established this multiple at 12.8 English inches, to 12 inches of the pied de roy ; since that, by another essay, 12.816 to 12, has been preferred ; a proof that a commensurate relation is unattainable.

Hence is seen how advantageously our Nation
N 2 might

might restore the ancient standard, since our foot, (however it has so happened,) is the only one out of such a variety, that has this commensurate relation to it. The table, therefore, of the comparative relation that any number of pyramidic feet bears, to an equivalent in our present foot and it's adequate fractions, would be simple and perspicuous. Whereas the new French metre would require a table of comparison replete with unsatisfactory and endless fractions, in attempting to ascertain the value of any number of their pied de roy, in relation to their new metre: since if ft.2, for example, be compared with the said metre, the result is 2.052933 &c. if 7, again be compared, the relation is equally unattainable, the result being 7.185209666 &c. ad indefinitum.

Whereas any number of pyramidic feet may be valued exactly in English feet, by the multiple .7296, and 2 such feet, for example are = ft.1, in.5.5104; and 7 such = ft.5, in.1.2864. Hence, we English, by restoring that primitive standard of the Pyramid, might, not only recognize the foot of the remotest ancient authors, but also retain our present denominations of yard, foot, inch, &c. and many useful scales, thereon depending.

But the French, by their new invention, or rather metrical project, for, in fact, they have invented nothing; have completely destroyed all reference to their own pied de roy, and to every established standard of the present and past ages. Borda, aware of this effect of his project, gave up the duodecimal division, and adopted the decimal, by which is retained a fallacious appearance of commensurability with the pied de roy, as seen in the following table, which the law obliged him to adopt.

TABLE.

TABLE.

PIED DE ROY.

| | |
|-----------------------|-----------|
| Millimetre - - - - - | 0.0030794 |
| Centimetre - - - - - | 0.030794 |
| Decimetre - - - - - | 0.30794 |
| METRE - - - - - | 3.0794 |
| Decametre - - - - - | 30.794 |
| Hectometre - - - - - | 307.94 |
| Chiliometre - - - - - | 3079.4 |
| Myriometre - - - - - | 30794. |

And these divisions they carry on to decimillimetre, centimillimetre, millimillimetre: and the ascending ten-fold quantities, by the denominations, decimymriometre, centimymriometre or hectomymriometre, chilimymriometre, &c. But these are all imposing appearances; and incommensurate with any number of the pied de roy less than 30 794, for not any of the series of fractions will measure the said pied de roy.

From the conference held between the Professor Bygge and Borda, (the inventor of the new metrical system in France,) it appears, the literati on the continent are sensible, an universal standard of measure, is a desideratum. And though the professor contended for the preference of the pied de roy, before that of Borda's choice; on the principle of an arbitrary quantity established, and it's relation with the measures of other nations and their own writers, now sufficiently understood, being a more eligible object, for an universal standard, than a new arbitrary quantity no where received, nor it's bearings, either collated with foreign measures, or any where understood: and surely such reasoning is sound and pertinent.

But Borda gave not into the Professor's arguments, being persuaded the new discovery of a meridional degree

gree, furnished a natural, not an arbitrary quantity ; and a metrical system founded on a natural standard, long fondly believed, would be acknowledged, and at length received, by all civilized nations in the world. This, the metre, of which he was so enamoured, as to make it the ground work of a system, was equal to 3.0807 Paris feet, or pied de roy, which is incommensurate with a single foot, and it's duodecimal divisions into inches and lines. After this metre had been sometime in circulation, and believed to be a ten millionth part of a quarter of the circumference of the earth, through the poles:

Then arrived Bouguer's discovery of a degree, measured in Peru, by which the quarter of the circumference was pretended to be less, than Borda made it; and the metre held to be 3.0794 Paris feet. And let the learned decide in favor of Borda's metre, or refute them both, the latter was settled to be the most accurate, by an act of the legislature !!!

But what is truly surprising, that the French literati should have made most useful discoveries in Egypt, especially from the great Pyramid of Giza, and then seek from a discovery made in Peru, a standard of measure ; when the Pyramid offered them one so nearly equal to that, which they have adopted, and of an authority and character far superior to any thing they can expect, will ever be acknowledged in their indeterminate new system.

SOLOMON =

SOLOMON'S TEMPLE.

Advertisement to the Reader.

IT may, perhaps, appear to some of my readers, that the freedom, with which a few passages of the sacred text are scrutinized, borders on temerity. But it ought to be considered, there is a great difference between matters of merely historical facts, and dogmas of divine authority; between technical expressions, and such as convey the revealed truths and divine ordinances for the regulation of faith and morals; herein, indeed, liberties ought not to be taken, even with the authorized translations of the Holy Scriptures, by any person, whose qualification is liable to be called in question: nor shall I expose myself to the danger of censure from the higher tribunals, by attempting to bring even into discussion, a single iota of the sacred text, wherein the interest of religion is concerned. But when in the text we read of the height of a capital, or of it's column; of the number of cubits in a given dimension; of covering the floor of the Temple; and such technical matters; I shall think myself allowed to examine, compare, infer, and at least conclude. And when again from the latin Vulgate of St. Jerome, the expressions, *textit pavimentum*; and *stravit pavementum*, are rendered, in the English Bible, synonymously; I shall both scrutinize the

the idioms; and even question the competency of the translators, when by their wrong turned idioms, manifest incongruities are recorded as Scripture: for example, when they convey to the mind, of an English reader the idea of a gilt floor, from mistaking the latin idiom *texit pavimento*; and when from a similar misconception, this same floor is said to be laid with deals and when this very floor, which is really, said to be, and was paved with the most costly marble of great beauty by the terms *stravit pavementum preciosissimo marmore decore multo*, is disguised and thus translated in the English Bible, "And he garnished the house with precious stones for beauty:" 2, Chron. Chap. 3, V.

I shall not here anticipate the reflections of my readers, who, however, must, by this example alone be satisfied with me for questioning the competency of translators, at least, when they had to express technical peculiarities, in equivalents in English.

OF
SOLOMON'S TEMPLE.

CHAPTER VIII.

OF THE EXTERNAL DIMENSIONS.

THE history of this Temple comes down to us, on sacred record, as a work that commanded the highest respect and universal admiration of the whole people of God: a work that impressed the minds of foreign visitors, with inexpressible pleasure; that overpowered the sensibility of an accomplished crowned head, accustomed even to Asiatic magnificence, in her own country: a work, in short, devised by the most knowing and wisest of men: and executed by an architect, whom, in his wisdom, he selected from amongst the most accomplished, that the nursery of the arts and sciences then produced. This Temple, so pleasing even to heaven, as to be permitted to be called, the house of the Lord; is the subject of which I now undertake to treat. Not that I shall vainly attempt to give an adequate description of its majestic perfections, but only to bend my most earnest and respectful endeavours, to explore, as many particulars of that astonishing paragon, as the means within my reach, may enable me.

After many years amusement, amongst the commentators of Vitruvius, and some, rather successful, attempts, to dispel the mist, they have spread over that author's documents; I lately began to feel something

like self reproach, for so long neglecting to apply myself, to the study of the noblest piece of architecture, that ever has yet been devised by man.

I was naturally led to search after the particulars of this Temple, in the holy Scriptures; as in them, the history of it commences, and the description of it there, must be considered the most genuine; not but I expected to receive much aid from commentators. Pursuantly, I turned to the sixth chapter of the first book of Kings, and presently discovered the reason of St. Jerome's admonition, who in his epistle to Paulinus, says, "such and so important is the book of Chronicles (Paralypomenon,) that a man deludes himself, if he fancies, he has a knowledge of the Scriptures without it."

This is exemplified, in the 2d and 3d verses of the 6th Chap. 1st of Kings, where we read, "the length of the Temple was 60 cubits, the breadth of it 20 cubits, and the height of it 30 cubits."

And in the 2d of Chronicles, chap. 3, v. 3, we read, "the length 60 cubits in the *primitive measure* (in mensura prima) and the breadth 20 cubits." But the height is reserved to the next verse, "and the portico was in length according to the breadth of the Temple, 20 cubits: but the height was of an *hundred and twenty cubits*."

By the collation of these passages, it is evident, that, either the height in one of the statements, is at variance with the height, in the other; or, two very different quantities of measure, under the same appellation of *cubit*, must be admitted, not only in Scripture diffusively, but also recognized, in this description of Solomon's Temple. The marked precision, with which the text records the dimensions in Chronicles, not as
contradictory

contradictory, but as explanatory of the dimensions, in the book of Kings, precludes all suspicion of a typographic error : the latter part, therefore, in the above alternative, must be received.

To ascertain, then, what these quantities may be, and their respective application to the recorded dimensions, is the problem, that is now presented for solution. To facilitate this work, and render it more decisive, it will be expedient to trace, as far as my means will enable me, the appellation of cubit, as a linear quantity of measure, to a probable origin.

That the denomination of a cubit measure, is ancient, there is no dispute. But that the Jews used any measure, under that name, at the time the building of the Temple was in contemplation, can never be proved; on the contrary the tradition has descended, even to these times, that their hand-measure, used, as we do our ten foot rod, was exactly of the length of the granite Chest in the Pyramid of Giza, by whatever name it was called ; the term *we* distinguish it by, is, the *fathom of the Hebrews*. If it be asked, whence the Jews derived that precise length of measure ? I answer, they were habituated to it, in their Egyptian bondage, and Moses, their leader, was also well learned in the Egyptian sciences, and, no doubt, would retain and perpetuate a measure, of which he knew the standard to be so permanent, as the Pyramid and Nilometre.

That the Jews also divided this hand-rule, or measure, into four parts, is apparent from the circumstance of the first translation of the Pentateuch, from the language, in which Moses wrote, into vernacular tongues ; because by whatever name that fourth was really denoted, in the original, the translators assumed that deno-

mination of measure for it, to which that fourth part corresponded, or very nearly approached. For certainly a translator must turn the appellations, peculiar to a particular people, into equivalents in the language, into which he translates. As when we read an English version from a French author, we expect not to read, *3 toises*, as the dimension of an apartment, but 6 yards, or 18 feet. So in like manner, when any ancient nation, or people, read a version of the book of Genesis, from the Mosaic language; they could not have understood the dimensions of the ark, had the quarter of the hand-measure been inserted, as expressed in the original; therefore did the translator give the equivalent, which was called cubit.

Hence it was, the prophet Ezekiel, writing for the comfort and edification of the captive Jews in Babylon, in his vision, which he relates, cautioned them against an erroneous acceptance of the term cubit, as in use there: knowing that it was not equal to the former vernacular term cubit, expressive of a quarter of the original standard at Jerusalem; (which for distinction, I call the hand-measure or rod;) saying, "and the measuring reed which the man held in his hand, was 6 cubits long, by the cubit with a palm;" by this the Jews, habituated, in their long captivity, to the Babylonian cubit, were guarded against error: and we, by this caution given to them, can ascertain what the Babylonian cubit was; since we know the quarter of the hand-measure, translated by the term cubit, was the cubit of the Nilometre and of Cairo, from which if we take a palm, there will rest the cubit of Babylon; which, if we admit the palm to be equal to 3 inches and .889, will be equal to $1\frac{1}{2}$ foot English. This, therefore, is the first variation

variation from the cubit of Cairo and Nilometre, or from the fourth part of the hand-rod. And a Jewish Kalendar, published at Oxford 1693, said to be the only one that was ever printed in England, in it's brief equation of Jewish measures, says, *Cubitus communis* equal to $\frac{1}{4}$ a yard; *cubitus sacer* equal to 1 yard. The common, therefore, is that of Babylon, but a cubit of a yard I have no where else met with.

The Bishop of Peterborough and Doctor Arbuthnot have that of Cairo: and we read of a cubit called geometrical, equal to 6 other cubits, by which I imagine is meant Ezekiel's reed.

Felicion, a well known French author, mentions 3 sorts of cubits: that which he calls the great cubit of 9 feet, (he means Roman Cossutian feet) equal, he says, to about ft.8, in.2, of the *pied de roy*: an other of 3 feet, equal to about ft.1, in.10, of the *pied de roy*; and the little cubit about ft.1, in.4 $\frac{1}{2}$ of the *pied de roy*. But he gives no authority for any of them.

Calmet, an approved French commentator, has for the cubit 20 inches and $\frac{2}{3}$, of the *pied de roy*, this reduced to English measure, by the nearest multiple 1.003, will be found to mean the cubit of Cairo.

The cubit of the later Greeks, called *pechus*, is ft.1, in.6, and a small fraction, of our measure; and their little cubit, called *pygme*, is ft.1, in.1 $\frac{1}{2}$, and somewhat more. The cubit of the modern Romans, ft.1, in.5, and almost an half.

There is nothing surprizing in these variations of the cubit measure, when we consider the unscientific expedient, to which the dispersed descendants of Noah had recourse; when the offspring of those amongst them, who had removed to a great distance from that
stable

stable monument the Pyramid that furnished the Egyptians with an invariable standard, no longer retaining this scientific tradition, yet finding themselves under a necessity of ascertaining quantities, knew no better invention of standards, than, as the names adopted prove, the limbs of their bodies: a miserable expedient indeed, and the parent of all the varieties and confusion of measure, that have over-run the earth!

And who can believe that Solomon, who certainly well knew of the Nilometre, and highly probable it is; he knew also of the geometrical perfection of the Pyramid, and of the standard inclosed in it; for he had much more superior means of investigation than we can pretend to: who, then, I say can believe that he relinquished the stable and ancient measure, translated by the term cubit, to follow any of the vague quantities of measure of other nations?

It is, therefore, decided that one of the quantities established at Jerusalem, for a linear measure, was the fourth part of the granite Chest, and was called by a name more appropriate than cubit, by which name, however, we, at this time, must know it: and the other measure will presently be proved to have been, what we call the fathom of the Hebrews: and both these measures, might have been called by the same appellative, though with the adjuncts, of little, and great.

This much premised, I come now to the grand point in question. The reconcilment of the different statements of dimensions of height, in the Temple; as recorded in the 1st of Kings and 2nd book of Chronicles; in the former, 30 cubits; in the latter, 120 cubits: and also, to combat the opinion of the length and breadth of the Temple, being by the cubit of Cairo: although many
other

other dimensions in and about the Temple, are evidently recorded by that cubit, which, for distinction, I shall, hereafter call, customary cubit ; the other measure, the great, or fathom cubit.

I did expect some light would have been obtained from commentators, on a subject of such interest as Solomon's Temple ; especially from Calmet, but to my surprise, I find nothing more, than a confirmation of what I had discovered before ; that the cubit of Cairo, and not the Babylonian, is the Scripture cubit. As to the disagreement in the stated heights, he cites other authors, who were of opinion, that the passage in the Chronicles, should be corrected by the statement, in the book of Kings ; and this is just the reverse of St. Jerome's admonition, see page 108, Calmet, however, says not so, yet leaves all as cloudy as he found it.

Leonardus de Sancto Martino, who published a latin comment on the Scriptures, last century, undertakes to reconcile the difference, in a way peculiar to himself: he contends, that the Temple comprized 4 stories, in the whole altitude, of 30 cubits each in height ; and, no doubt, this would account for the general altitude of 120 : he cites Josephus in proof of the 4 stories, but Josephus clearly divides the height, into 2 only ; and the sacred text gives not the least authority for either of the interpretations : and the Scripture, as far as it is clear and evident, is certainly to be preferred to their authority. It appears Leonardus mistook the 3 stories of the external small houses in the outward circuit of the walls of the temple, for 4 stories within the walls : which houses will be fully discussed in next chapter.

But

But suppose his explanation of 4 stories, correct a much greater difficulty would yet remain for solution: viz, the great disproportion of the 8 of 120 cubits, on an ichnographia 60 by 20. To bring these dimensions into English yards, the length of the Temple would be 36 yards, and a trifle more than a foot: the width 12 yards, and 5 inches and $\frac{1}{2}$ and the height of the Temple 72 yards, 2 feet, 10.56 inches.

Now to say nothing of such an altitude, with a width not 12 yards and $\frac{1}{2}$ a foot: we will only reflect a little on the consequence of such an acceptance of dimensions: let us represent to ourselves a saloon, in a noble house, 36 yards long and 12 yards wide: and $\frac{1}{2}$ of the length taken off, as it was in the Temple, for the oracle, wherein the ark of the covenant was deposited. Can any man, of the least experience, prevail on himself to believe, this was the size of that house of the Lord, of which Solomon wrote to the king of Tyre, "And the house which I build is *great*, for great is our God above all Gods." 2 Chron. chap. 2, v. 5, and again v. 9. "Even so prepare me timber in abundance: for the house, which I am about to build, shall be wonderful great." And this was strikingly attested and verified by the Queen of Saba, but are we to imagine her spirits were agitated beyond measure, that she stood in silent astonishment at the sight of the magnificence, of a building 36 yards long and 12 wide! Are we to believe, 30 000 wood-men or fellers of timber were retained, 10 000 one month, relieved by an other 10 000; they a month; and then succeed by the other 10 000, for a month; then the first 10 000 began again, and so on; in order to procure the abundance wanted: and 70 000 labourers, for carrying materials; and 80 000 stone masons: moreover of officers, to superintend

intend the works, 3000, and 300. See 13, 14, 15, and 16 verses of the 5 Chap. 1 Kings. And two last verses 9 Chap. 2 Book of Chronicles.

Are we to believe all these were employed; 7 years, to bring to perfection a building of such dimensions, as must be admitted to be no more than sufficient for a saloon, in a gentleman's house, in the acceptation of customary cubits in the stated dimensions of 60, and 20 cubits, recorded in 6 chap. first of Kings?

St. Jerome, when he translated the book of Kings, no doubt, perceived, the term cubitus, which he subsequently there adopted, was liable to be mistaken for the cubit of Cairo. Therefore when he translated the Chronicles, and had the subject of the Temple's dimensions again to translate from the same original expression, he qualified the term cubit, by which he gives the length and breadth, saying, cubitus *in mensura prima*, viz, cubits *in the primitive measure*, and this he has done in the second book of Chronicles, 3 chap. 3 v. "the length was of 60 cubits *by the primitive measure (in mensura prima:)*" and although we at this time might be at a loss, to discover what that primitive measure really means; yet the people, especially the Jews, in his days might be, and no doubt were, very well acquainted with that term: nor has he left the ages, then to come destitute of the means, to ascertain, what the (~~that~~ *primitive,*) measure signified; for in the 4th verse, he translates the terms, which express the height, by the customary cubit, or cubit of Cairo, saying, "and the portico that was before the house, the length of it was according to the breadth of the house, 20 cubits, and the height was 120:" now in the book of Kings, the height is stated to be 30 cubits, of which, in their

unqualified acceptance of customary cubits, the difference is apparent to all the world : but 30 cubits, of the *primitive measure*, was certainly known to St. Jerome, to be equal to, and intended, by him, to express 120 of the then circulated and customary cubits ; otherwise his illustration of the dimensions, by the insertion of the *primitive measure*, had been to no purpose, and altogether nugatory.

Hence it is demonstration, *the primitive measure*, in question, was a quantity, by whatever name originally called, equal to 4 customary cubits, or cubits of Cairo, which are equal to the length of the granite Chest in the Pyramid ; and was that which is denoted by us, the fathom of the Hebrews.

It is evident the height, 120 cubits, alludes to cubits habitually and usually so called: but why the author of the first book of Kings, recorded all the three dimensions by cubits, which are, by the above positions and reasoning, proved to contain four times the length of the customary cubit, is a problem, which, though it no ways questions the conclusion of the former, seems to call for a solution. We must consider, then, that the great number of Tyrian workmen, that were sent to Solomon, called strangers, in the sacred text, no doubt, brought with them, their own terms of art, and denomination of measure ; and the cubit of Cairo, was the only great or integral measure they used : whereas the Jews, the natural subjects, were accustomed to a measure four times that length, as *their* highest integral denomination, and though the fourths of it were, at first, recognized by the Jewish workmen, as the cubit of the foreigners, yet as these strangers persevered in their term cubit or pechus, or by whatever name cubit was called in their language,
at

at length both measures might have obtained the same appellation, and might be distinguished from each other by circumstances ; and by reason of their great disparity, were not liable to be misconceived. As amongst our mariners, at present, who use three different lengths, under one appellation, of fathom, wherein the disparity is not so great, yet circumstances render the discrimination sufficiently clear.—The author of the book of Kings, therefore, when he conformed to these provincial assumptions of measures and names, had no suspicion that his statement of 60, 20, and 30 cubits, for the outlines of the most magnificent Temple in the whole world, would ever be mistook, for cubits of Cairo, by which it's size is assimilated to that of an ordinary dining room.

The dimensions of the Temple, by this fathom-cubit, instead of 36 yards by 12, will be in length yds. 145, ft.2, in.9.12: in breadth, yds.48, ft.1, in.11.04: and in height, yds.72, ft.2, in.10.56.

These are dimensions that bespeak a magnificence adequate to the inspired intention of the founder of the Temple, intimated, when he said, "the house I build is great, for great is our God."—"The house I am about to build is wonderful great." The grandeur, the beauty, the majesty and magnificence of this truly wonderful Temple, are unrivalled by any, the most costly, and noble of the Grecian phana: brought to perfection, in 4 years, while that at Ephesus, the nearest approach to it, was so retarded, as to be more than 200 years, before it was completed, as Pliny informs us.

It may be said perhaps, though the cubit of Cairo, gives the dimensions, on too small a scale ; the cubitus

sacer, or sacred cubit, mentioned in the Jewish kal dar, above cited, might have answered the purpose. This will produce but 60 yards for the length; 20 yards for the breadth; and 30 yards for the height. Now, the ichnographia, by these cubits, is by no means adequate to the number, and nature of the things recorded, furniture and apartments contained in the Temple; such as the atrium, or court surrounded by 3 rows of marble and one row of cedar columns; a grand basilica, where of the throne was ascended by stairs on each side, with the extent of the platform, occupied about 11 yards; 12 curious tables; a golden altar; and thousands of golden and silver vessels, &c; and one third of the length assigned to the oracle, or sanctum sanctorum. But this ichnographia were admissible; yet it will prove to be an insuperable task, to attempt to reconcile, by this measure, the 120 cubits of height, to the other recorded height; for 30 cubits augmented, by the cubitus sacer to 30 yards, reach not to half the height of 120 cubits of Cairo, which, without augmentation, produce about 72 yards.

In conclusion, then, of this chapter, it may safely be established, as a rule, that, as there are 2 measures called cubits, in the sacred records of the dimensions belonging to this Temple; when a manifest absurdity would follow the assumption of the one, the other will give the true dimension. And both these scriptural cubits, in the quantity they import, are established the same ancient, stable, and perpetuated standard; as the granite Chest in the Pyramid of Giza, the one being equal to the entire length of the Chest, the other exact a fourth part of it. And as the Nilometre cubit is also the same, there can be no doubt of their being known
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also to Solomon, and to the artists, he employed, from Tyre.

But, without a known standard of stability, and antiquity, to which we are to refer, all reasoning, from denominations of cubits, orgyia, pechus, passus or gressus to the quantities imported by them, is nugatory.

CHAPTER IX.

OF THE DIMENSIONS AND DISPOSITION OF THE INTERIOR OF SOLOMON'S TEMPLE.

THE object that now calls for my attention, no otherwise belongs to the interior of the Temple, than as it had a communication with it, by a side door in the wall. This object is, the 3 stories of buildings in the circuit of the Temple's walls, which Josephus, book the 8, chap. 2, thus describes; "round the outward walls
"were erected 30 cells, or small houses, communicating
"with each other, and forming galleries, and at the
"same time answering the purposes of buttresses, by
"supporting the walls. These cells were each 5 cubits
"broad and of the same length, and 20 cubits high.
"Over these were two other floors of the same proportion, and the uppermost of the cells were on a level
"with the lower story of the fabric. They were fastened
"together by large beams, so disposed as to make them
"appear of one piece, and as if they gave additional
"strength to the walls."

The authority, on which Josephus grounds this description, is the 5 and 6 verses of 6 chap. 1 of Kings (alias 3 of Kings :) but the text records the width of the second floor, 6 cubits, and the upper floor, 7 cubits. The width is clearly meant, from the Temple wall, to the
outward

outward wall of these small houses ; though the length must have been, from one separation to the other, and in the two upper stories, or chambers, certainly the distance, from the Temple, to the outwall of the chamber, was more by one, and in the top chamber, by 2 cubits than the space called the length. Here the difficulty is, to account for the reason of the top floor being 2 cubits, and the middle floor one, more than the ground floor. St. Jerome calls these floors, *cœnacula* ; and they are only once mentioned in the book of Chronicles, viz, 9 chap. 2 book, where it is said, they were gilt through out. But no reason is assigned, in Scripture, for the increased width of the middle and upper cenacle, nor how the increase was obtained.

It appears probable, this difference was in consequence of a retrenchment, in the thickness of the outward wall of the cenacles : on the ground story, might have been 3 cubits in thickness, which is not quite the thickness of the Temple's wall, but certainly sufficient, as the three stories of cenacles completed only 10 cubits of height, and the Temple was 120 high. Then the wall, of the middle cenacle, reduced to 2 cubits, and of the upper cenacle, to one cubit, which in work of squared, or guaged stones, would be of very sufficient strength.

As to the dimensions of the cenacles, recorded in the sacred text, as well as by Josephus, of 5 cubits square, by 20 cubits high ; it is evident the suggested rule here obtains : for what can be thought of a chamber, 3 yards square, and 12 yards with one sixth of a yard in height ! Josephus tells us, there were 30 of the

small

* See this rule above page 118.

all houses, in the circuit of the walls, viz, 12 on each side, and, reckoning the 2 that fill up the angles, 6 at each end of the Temple. Now it has already been sufficiently proved, in the preceding chapter, and will be further verified in the sequel, that the length of the Temple, inside, was 240 customary cubits, equal to s.145, ft.2.76. Whoever, then, shall contend, that 25 cubits by 5, was intended, in the text, to be understood of customary cubits, and not those, in the primitive measure, (in mensura prima,) not only defends an absurd proportion of a chamber, but will not be able to extend 30 such houses, to much more than $\frac{1}{2}$ the length of one side wall of the Temple, instead of extending them, all round the 3 walls.

But by the great cubit, the 30 houses will exactly embrace the circuit of the 3 walls; and, taking the thickness of the end wall, at 7 customary cubits, there will be about in.4 $\frac{1}{2}$, for the timber partitions throughout, leaving the dimensions of the length of each cenacle, exactly 5 fathom cubits, or cubits of the primitive measure, square: that is each cenacle will be 12 yards, and in.5.76 square, and the height equal to the length: with the addition of one customary cubit, to the width of the middle cenacle, and 2 such cubits, to the width of the upper cenacle.

If an objection should be started against this explanation, that the original author would not have given the length of a single dimension, by two kinds of cubits, as here argued, first 5 great cubits and one small one, then 5 great cubits and 2 small ones, for he did not so discriminate, but related the dimension by 6, and then by 7 cubits.

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To this I answer, the objection would only obtain, were there no criterion, whereby to discriminate, between the recorded dimensions 5, 6, and 7 cubits: but in this circumstance, the reader, accustomed to the difference, between the great and small cubit, perceives, the 5 cubits, of the first, or ground cenacle, were such cubits, would cause 30 houses, or ground cenacles, completely to environ the 3 walls of the Temple; of course, they were 5 great cubits: and when he reads 6 cubits, in the width of the middle cenacle, the known size of the first, is a sufficient criterion of discrimination; since the circumstance evidently informs him, the increase was, by the addition of the small cubit; and in like manner in the upper cenacle. Moreover, in Scripture records of dimensions, the fractional parts of cubits, are seldom noticed; but the whole cubit is inserted; as, when the girth of the molten sea, is said to be the 30 cubits, and the diameter stated 10 cubits, which, if taken ad unguem and norma cannot be accurate. It is, therefore, by no means certain, that the retrenchment in the wall of the middle cenacle, was so much even, as the smaller cubit; and still less certain, that the upper cenacle, was so much, as a cubit more, than in the middle cenacle. Hence it might be, that the exemplar, or traditional instrument, used by Josephus mentioned not these setts-off, or retrenchings in the walls, as he says, the middle and upper chambers were of the same proportion, as the first. And in the book of Chronicles, the cenacles are but once mentioned and then only to inform us they were gilt.

These small houses, each containing 3 cenacles, in elevation, were equal to half the altitude of the Temple and Josephus insinuates, that a floor was laid, the whole length and breadth of the Temple, at that middle height

height ; but there is no warrant for such a disposition, either in Scripture, or in reason : for to what purpose was the Temple raised to the altitude of 120 customary cubits ; if 60, which are just $\frac{1}{2}$, were sufficient for every thing belonging to the interior of the Temple : as the oracle, or sanctum sanctorum, the grand basilica, the throne, the alter, ten tables, the inward atrium, or court, with it's columns &c ; all evidently standing on the pavement of the Temple, and comprizing every metrical object, recorded, as within the walls ? Certainly, then, it were absurd to suppose, another area of equal extent and altitude, and no furniture whatever assigned to it ! In the sequel, I shall have occasion to treat of an object, to which, probably, Josephus intended his allusion to be directed.

The description of the cenacles, closes with the 1 Kings, 6 chap. 8 v. where we read of a door, out of the right hand side of the Temple, in the middle of the wall's length, giving to the foot of the winding stairs, constructed within the thickness of the wall, which wall will be shewn, in the sequel, to have been more than 4 yards thick ; by these winding stairs, they ascended to the gallery of the middle cenacle, and thence, by continued windings, to the upper cenacle ; these galleries conducted those, who were permitted, all round the outside of the walls, and must have received their borrowed light from the windows of the cenacles, whereof the partitions, next to the galleries, were, probably, only half the altitude, or even less. These cenacles seem to have been partly for the use of the priests, and partly, for depositaries of the costly vestments, mentioned by Josephus, with the many thousands of gold and silver vessels, not in daily use. And it is worthy of remark,

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that the access to the two upper suites of cenacles, was only by one door, out of the Temple. And they were all lined, and ceiled with cedar, and gilt; composing no inconsiderable part of the magnificence of this wonderful and renowned house of God.

In the v. 9, *ibid.* the allusion is to the entire Temple; saying, "And he built the house, and he completed it; he also covered the house with a cedar ceiling." Josephus gives not the description of the roof, which is an important object, and calls for particular attention. The first allusion to it, is in the v. 10, *ibid.*: "And he built a floor all over the house 5 cubits high, and he covered the house with cedar joists." Again the concluding words of the v. 15, *ibid.*: "And he covered the pavement of the house with deal boards framed." for I conceive *tabulis abiegnis* signifies deals connected, by tongues and grooves, and secured in frames: the expression *textit pavementum*, has been strangely misunderstood, as if it imported that a deal flooring was laid on the pavement; than which nothing can be more foreign to the real import: which one might have expected any interpreter would have perceived, by what is recorded Chron. 11, chap. 3, v. 5 and 6, which in our English Bible is translated, indeed, rather obscurely: I here give the latin of St. Jerome v. 5, "Domum quoque majorem textit tabulis ligneis abiegnis, et laminas auri obrizi affixit per totum, sculpsitque in ea palmas, et quasi catenulas se invicem complectentes, v. 6. Stravit quoque pavementum templi preciosissimo marmore, decore multo." Which passage, in English, as literally as possible, stands thus: "The greater house also he covered with fir-wood planks, and affixed throughout leaves of refined gold, and he carved in it palms, and little chains,

as it were mutually clasping each other, 8 verse. The floor of the Temple he laid with most costly marble, of great beauty."

Hence it is surprizing, that the former passage, in the book of Kings, "and he covered the pavement of the house with deal boards framed," could be mistook for a flooring of deal laid on the beautiful marble pavement. Or that the 1 Kings, 6 chap. 30 v. where it is said, "but also he covered the pavement of the house with gold, both inside and outside," should have been understood, as if the marble pavement itself, had been gilt; as Josephus even relates it.

Whereas the terms *textit pavimentum*, most certainly are to be understood, as *covering in*, or putting on the roof, or ceiling, over the pavement. Which covering, or ceiling, was carved and gilt both within the Temple, and in the ceiling of the portico without. The absurdities and incongruities, attendant on the other acceptations, I shall deem a sufficient authority, for pronouncing them erroneous.

To proceed with the explanation of the roof, in the 10th verse as above cited, he erected a tabulatum, that is a continued piece of joinery, over all the house, 5 cubits high. To facilitate the subsequent explanation, we must recollect, that Hiram was a most accomplished architect, and such a character is no where more necessary, than in planning a roof; he had, doubtless, seen that kind of building, called a basilica, wherein was necessarily included a royal throne.* and in 2 Chron.

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chap.

*These were certainly structures, in times preceding the date of the books of Chronicles, wherein, there were royal thrones; as allusion to them is made, where it is said, there was not in the world, such a throne as Solomon's. Chron. 11, chap. 9, v. 19.

chap. 4, v. 9, it is said he made in the Temple, an atrium, and a grand basilica. These two grand objects occupied the whole extent of the Temple, from the cedar screen of the oracle, to the great folding doors of the front, at the portico. Therefore, the whole roof was, of course, to be like the roof of a basilica. What that is, we learn from Vitruvius, whose documents were such, as he received from Grecian masters, as he tells us himself, and they derived them originally from the same school which Hiram had frequented. Vitruvius, book 5, chap. 1, describes the roof of a basilica, within, as resembling the inside of the shell of a tortoise; or what our architects call, a coved ceiling; with this difference, that over a basilica, the coves from each side, meet in the centre, without leaving any part flat, and the end coves coming to a point, form groins in the angles. This, I conceive, was the general form of the interior of the roof, constructed with cedar joysts of a large scantling, and all framed and put together first, on the ground. These cedar joysts, were cut in such bendings, as were necessary to form, when they met each other, the curve called *testudo*, from the resemblance of the tortoise.

The whole art consisted in framing these cedar joysts, one end into the end of another, by mortise and tenon, till they extended from wall to wall, and rose in the middle 5 customary cubits, equal to little more than 9 English feet, from the level of the tops of the walls; not as a segment of a large circle, but like half of a very narrow ellipsis, viz, of an ellipsis with the longest diameter 80 cubits, and the shortest 10 cubits.

A series of these cedar bands, curiously carved and gilt, I conceive, formed the inside of the roof, and were overlaid with the *tabulatum*, or framed planks of fir: at
once

once affording, the protection of the beautiful marble pavement, as also of the open kind of fret-work, chain-work, cherubs and other devices, carved and gilt, between the cedar bands: which bands sprung from the wall plate, all round, without any necessity of roof beams; as the walls were more than 12 feet thick, certainly strong enough, even for stone arches to have sprung from them; had such roofs then been in practice.

The oracle called the *sanctum sanctorum*, is the object, that comes next under consideration; in this, was deposited the ark of the covenant. It was 20 great cubits, from the back wall of the Temple, in length; and the same, that is the width of the Temple, in breadth; in the Chronicles the height is omitted, but in the book of Kings it is said to be also, 20 great cubits: and this part of the Temple, which was 20 great cubits square, had, instead of a wall, a separation, constructed of cedar-wood, in framed work; and on the pannels, on both sides, most beautiful sculpture. The height of this cedar screen, was what determined the height of the oracle, that is, 20 great cubits; but I conceive, we are not to imagine, there was a covering, or ceiling, over the whole area of the oracle, at that height; for the effect of that would have been, to have shut out the light from the oracle; as the external series of cenacles occasioned the sills even of the windows, which were on the sides of the Temple, to be, almost as much elevated, as the height of the screen. The cornice of the screen, probably, ranged all round the walls of the inclosure, and exhibited a kind of boundary of height.

Before I treat of the superlative workmanship, within the oracle, it seems proper to describe the folding doors. In 1 Kings, chap. 6, v. 31, it is said, "in the
entrance

entrance of the oracle, he made little doors of olive-tree wood, and posts of five angles." St. Jerome expresses this last part, *postesque angularum quinque*, which is rendered in our English Bible, the lintel and side posts were $\frac{1}{2}$ of the wall. But to adhere to St. Jerome's version, I think, *posts of 5 angles*, is the better architectural expression: Vitruvius calls these posts, *capita*, which, strictly, signifies the ornamental mouldings affixed to door frames, consisting of fascias one under another, and their square or sharp edges, or what St. Jerome might mean, by angles: in Ionic work Vitruvius orders three of these cornas or fascias; but as the symmetry observed by Hiram, was that, which is called Corinthian, he might with propriety, have introduced 5. This seems to me, what is meant by, *post of 5 angles*. But $\frac{1}{2}$ of the wall, it cannot mean, as the separation was, not a wall, but a cedar screen.

The little doors are the same as described in v. 32 *ibid*: and I hesitate not to assert, that they are exactly, what Vitruvius calls *valve*, and *quadrifores*. And from the usual manner, in which window shutters are hung, we may form an idea of the *quadrifores*, which are called *valvæ*, because hung to the door posts in pairs, they fold up, as it were, one valve or leaf, against the other, that hangs on the post; and each door post sustaining a pair of valves, hence they were called *quadrifores*. And when St. Jerome called these *ostiola*, the diminutive of doors, the allusion was to the valves or leaves singly. Josephus says, this entrance into the oracle, was 20 cubits wide; of course each valve, was full 3 yards wide: and Vitruvius says, the *quadrifores* require the height and breadth to be equal; each valve therefore

therefore, was yds. 12, in 5.76 in height : and the pannels of the valves, were adorned with bas-relief sculpture of foliage, cherubs, and other devices ; but the stiles and rails, that framed the pannels, were covered with thin plates of gold, fastened to them with golden studs ; each stud worth 50 sicles, and the golden sicle was about fifteen shillings. The studs are in form of artificial roses, projecting between 2 and 3 inches, and about the same in diameter ; on the stiles and rails of the doors of the Pantheon, at Rome, these studs are made of brass, about an 180 in number, placed in rows : probably those on the doors of the oracle, were something of the same form ; and, to take them at the same number, these golden studs alone, were equal, as gold now is valued, to, at least, 6750 pounds sterling. Hence we see, how worthy of notice, this object was, and how deserving of a place in the sacred record.

It may also gratify the curiosity of some of my readers, if I here insert an estimate of the value of the gilding, throughout the interior parts of the Temple, considered as mere flat work, for the carved devices would require three times, and if very bold relief, even more than four times the quantity of gold, that would be required, to cover the flat surface they occupy.

The walls were entirely covered, the Scripture informs us, with cedar wainscoting ; the ceiling was also of cedar, and all was gilt : the height of the walls was 120 little cubits, i. e. cubits of Cairo ; the ceiling on account of its carved form, was about 100 cubits, though the breadth of the Temple was only 80 such cubits : then the length 240 : and the cedar screen 80 cubits square, gilt on both sides : these dimensions will be found to produce 113 600 square cubits. The size of

a leaf of gold, beaten as thin as the purest gold would admit of, is $3\frac{1}{4}$ inches square: and 500 such leaves, worth, before the tax was imposed, 30 shillings, will completely cover 11 square cubits of Cairo, and nearly $\frac{3}{4}$ of a square foot; allowing then this fraction of a cubit, for the lapping of the edges, the price of the gold would be 15490 pounds sterling, and 18 shillings. And estimating the price of work, in beating, as with us, it would have paid, both gold-beater and gilder, in those days, at Jerusalem; we may, by the above statements form some notion of the expence of all the gilding. For where we read of plates of gold, fastened with studs, it is, I conceive, to be understood of such flat parts, as were liable to be handled; where the usual gilding would soon be effaced. But that the rest of the work, was performed by the leaf gold, as we use it; we gather from the 1 of Kings, 6 chap. 35 v. where we read, "and he carved cherubs, and palms, carving exceedingly, prominent, and covered all with leaves of gold wrought square to a gage." (*opere quadro ad regulam.*)

The two cherubs, that were of statuary work, 24 yards high, stood at the back of the oracle, with their faces towards the screen; with their wings spread, and somewhat hovering; the outward wing, in each cherub, touched the wall of the oracle, respectively; and the two inward wings met, in the centre. Each wing was 5 great cubits long: of course, the wings in each cherub met over the head, which we may infer bowed towards the ark. The transcendent beauty of these cherubs, and exquisite workmanship in them, Josephus tells us, is out of the power of description. And, indeed, when we consider, they were 8 times the height of a tall man, we must find ourselves at a loss, how to form an idea of the

them: For the extent of their wings touching both the side walls of the Temple, and meeting in the middle, was more than 48 yards.

And that no suspicion may here arise, in the reader's mind, as to the stated size of the two kinds of cubits, Josephus informs us, the folding doors of the oracle, in their aperture, had the extent of 20 cubits, equal to $\frac{1}{2}$ of the width of the screen: but if the 20 cubits, assigned to the width of the Temple, were customary cubits, then the whole screen was the door, as that was 20 of those cubits wide; and the absurdity of such a supposition, is evident.

I come now to describe the ordination and disposition of the grand basilica, and the atrium, or inward court; which together, occupied the 40 great cubits, before the foldings of the oracle, to the front doors of the Temple; as recorded in the 1 Kings; 6 chap. 36 v. "And he built an inward court with 3 rows of wrought stone, and 1 of trees of cedar." And in 2 Chron. 4 chap. 9 v. "He also made the court of the priests, and a grand basilica, and doors in the basilica, which he lined with brass."

From the circumstance of gates, or doors, in the basilica, it is very apparent the atrium was considered, as a part of the basilica, for the gates were, on the 4 sides of the atrium. This inward court is said, in the book of Chronicles, to be the atrium of the priests; Josephus says, it was for the admittance of such of the public as were qualified to enter: and that the part for the priests, was guarded by a fence 3 feet high, but this were but a very inadequate fence, and might be passed by a stride: I suspect he wrote 3 cubits, because there is no dimension, in the sacred record, by the foot: his translator

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might

might easily make the error. The fence, in question (if any such there were, besides ballustrades, which between the columns, formed the inclosure of the atrium) must have been a range of ballustrades, between the atrium and the throne; but I think this would have been mentioned, in the scripture account. Or Josephus might mean the continuation of the fence, in front of the atrium, from the angular column to the wall of the Temple, right and left, under the galleries. But be this as it may.

To proceed; in the description of the royal palace, and that for the queen, from the beginning of the 7 chap. to the middle of the 12 v. we have the ordination of an atrium, and a portico; and, in the latter part of 12 v. the same disposition, and ordination, are assigned to the atrium *interius* of the Temple of the Lord, and to the portico of the Temple.

The contents of the 10 v. *ibid*, clearly allude to what is called by Vitruvius, the *stylobata*, vulgarly called pedestals; wherein it is said, "and the foundations of costly stones, large stones of 8 or 10 cubits." These were, no doubt, for the purpose of *stylobata*, as they are said to be costly, or valuable (*preciosi*;) and though called by the general name, *stone*, were marble; and it were absurd to argue, that any architect would bury blocks of costly marble, in the foundation out of sight: when placed under columns, they are in full view; and being procured, in such large blocks, there can be no purpose, to which they could be assigned so natural and consistent, as the die of a *stylobata* which is required, in strict propriety, to be of entire piece of marble.

Now since these were used, in such size, in the atrium of the palace, to which the atrium in the house of

of the Lord is, by the sacred text assimilated; we are hence authorized to assign stylobates for the columns, in the atrium within the Temple, of 10 cubits high, with their die 8 cubits, in one piece. On these stylobates, called pedestals, the columns stood, the symmetry whereof the sacred text gives not, at least, as to none of the atrium; yet, as the symmetry of the metal columns is very minutely settled, in Scripture, we are not destitute of a criterion whereby to determine, the symmetry of the internal columns: I shall, therefore, presume to give them, the same diameter, as the external metal columns had; and this will be found to be very nearly 7 English feet. And as the diameter of a column, directs the rest of it's symmetry: and as the diameter of the metal column, could not be notified by cubits, whereof 12 was the girth; I shall use feet and inches, in assigning the particular symmetries.

Conformably to the design of a basilica, which is described by Vitruvius, a structure with columns inside, but none in the circuit of the walls without; I shall presume there was the due continuation of columns, on each side, from the angular columns of the atrium, quite to the cedar-screen of the oracle; and the spacious galleries, supported by the columns of the atrium, mentioned by Josephus, were continued over the side columns, to the screen. These galleries were, probably, what Josephus called the second story of the Temple, entered by a side door* in the wall. And to ascend to this aperture, or door in the wall, it was of course, necessary to continue the winding stairs, to a greater height, than

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*Josephus mentions a plurality of these doors, but they would require an equal number of staircases.

the ceiling of the upper cenacles ; according to Josephu to enter from the stairs, through the said aperture, into the spacious gallery on the right side of the Temple and the door, in that opening, would be perpendicular over the door, mentioned in the sacred text.

The disposition of the columns was such, as to support the fronts of the galleries, continued on three sides of the Temple, and 10 customary cubits, in breadth, the balustrades on the top of the entablature over the columns ; which balustrades are to be conceived stand, right over the centres of the columns beneath the stylobates, or, pedestals of the columns, are 10 cubits high, equal ft.18.24 ; and this dimension is the breadth of the walks, or piazzas, from the wall to the centre of the columns. The side rows of columns, are terminated, at each end, by pilasters: one pilaster against the cedar screen, the other against the inside of the front wall of the Temple; which last pilaster is to project 10 feet, but that at the screen 10 inches, and the very small fraction of .08 of an inch. From the face of the pilaster at the screen, to the first column of the row, the distance is equal 2 diameters of the column, viz, 14 feet: the 13 columns, each 7 feet in diameter, with 12 more intercolumns, at 14 feet, will leave a space, between the front wall of the Temple, and last column of the row equal to 18 feet ; therefore, by projecting the pilaster which was at the front wall, and opposite the last column, 4 feet, all the intercolumns would be equal, viz 14 feet ; and the piazza, at the entrance of the Temple wider than the side ones: and the 13 columns, and 12 intercolumns disposed in like manner, on the other side of the Temple, there will be between these rows of columns on the sides a breadth of ft.102, in.11.04 the width

will admit 4 columns, with 5 inter-columns, of the same marble materials, and the same stylobates, as in the side rows; and furnish a more spacious inter-column, in the centre, of ft.18, in.11.04, which we may reasonably believe, was so disposed, to furnish sufficient room to pass, when the priests carried the ark, through the atrium and basilica, to deposite it, in the oracle.

To complete the area of the atrium, and in the disposition of a square, or quadrangular court, pursuant to the order, directed in the sacred text, there must be 3 rows of stone, or marble columns, and one row of cedar; which most probably, were erected on marble stylobates, as the others were; these cedar-columns, 4 in number, ranging with the sixth column, under the galleries, right and left, and disposed right opposite to the 4 marble columns, next to the front wall, would perfect the quadrangular court, which, reckoning the angular columns each time, comprized 6 columns in each of it's sides; in the 4 middle intercolumns were the 4 grand gates lined with brass, which was plated with gold; and the other intercolumns were inclosed by ballustrades.

The symmetrical, or commensurate height of the column, is taken at $10\frac{1}{2}$ diameters, equal to ft.73, in.6, which, with the stylobate of ft.18, in.2.88, will leave ft.17, in.8.4 for the epistyles, and their ornaments. The capitals of these columns were carved, no doubt, in the form of the molten capitals of the metal columns, which will be discussed in the next chapter.

Thus I have suggested what appears to me to have been the ordination and disposition of this noble atrium, and grand basilica; nor have I much doubt of the oracle also having been surrounded by columns, in the
same

same disposition, on it's 8 sides; and by the continuation of the galleries over them communicating with the galleries of the basilica, by a door in the upper part of the cedar screen, which was 20 cubits higher than the floor of the galleries. And 2 Chron. 3 chap. 16 v. seems to allude to such a disposition, saying, "Moreover also he made, as it were, little chains, and disposed them on the tops of the column, in the oracle : &c." But, admitting the columns, here mentioned, alluded to the brazen columns, most certainly the little chains were on something in the oracle ; and as these chains were a becoming ornament for the metal columns, that seems an indication of their having decorated columns in the oracle,

But to pass to the last object, which is implied in the constituents of a basilica, I mean the royal throne : first, then, we read, 2 Chron. 6 chap. 13 v. "for Solomon had made a base of brass, and had placed it in the middle of the basilica, of 3 cubits long, and 3 cubits broad, and 3 cubits high, and he stood upon it &c." And 9 chap. v. 17, 18 and 19, *ibid*, "And the king made a grand throne of ivory and decked it with the purest gold. Also 6 steps to ascend to the throne, and a golden foot-stool, and arms on each side, and 2 lions standing by the arms. Moreover also 12 young lions, 6 standing on the 6 steps at each end. There was not a throne equal to this in all the world." And in the 11 v. *ibid*, "of these, to wit, of the boards of the thyiatree, the king made the steps in the Temple of the Lord."

Such is the description of the throne erected on the brazen base, in the middle of the basilica. The area in which it stood, in English measure, was ft.9, in.1. square; the golden foot-stool, in front of the throne, about

about 5 feet square, was placed near the front part of the base, allowing room for a ballustrade, or some such fence; and there was nearly 4 feet behind it, for the throne, probably, not more than 5 feet wide, and this would leave a margin, on each side, about 2 feet broad, for the lions, on each side of the throne; and the golden foot-stool elevated about 8 inches, and included in the 3 cubits of height, which is equal to 5 feet and nearly $\frac{1}{2}$; the 6 steps of thyia wood, producing 6 risers, and 1 riser from the upper step to the brazen base, another from that to the foot-stool, together, 8 risers, at about 8 inches each, which will complete the height of 3 cubits. The length of these steps was the whole length of the throne, or ft.9, in.1: and as a young lion stood on the back part of each step, we cannot imagine less than a cubit for the breadth of the treads: and the extent of the ground, from the first step on one side to the extremity of the steps on the other, was about 17 cubits, equal to 31 feet. The thyia wood, of which this flight of steps, on each side of the throne, was made, sent to Solomon as a rich present accompanied with gold, is said to be a very odoriferous and lasting wood.

The area of the basilica, in the clear of the plinths of the stylobates, (to the projectures whereof, inclusive of the projecture of the column's base, if there were any, 3 feet every were allowed,) is exactly ft.150, in.10, long and 100 feet broad.

The area of the atrium, in the breadth, the same 100 feet, in the length 92 feet. Besides the spacious piazzas, that surround it on 3 sides. The atrium, therefore, contains 1022 square yards.

And the distance, between the steps of the throne and the plinths of the stylobates, would be ft.34, in.6: and between the throne and the oracle, ft.73, in.4 $\frac{1}{2}$, and the same between the throne and the atrium.

CHAP.

CHAPTER X.

OF THE PORTICO OF SOLOMON'S TEMPLE.

THE majesty and grandeur of most of the eastern Temples, especially of this at Jerusalem, was displayed in the magnificence of the portico. It is this which first strikes the beholder's mind with those tranquilizing sensations, that take place of every idea but such as are raised by the consummate perfections of symmetries harmonizing with order, disposition and decorum, altogether bespeaking the dignified splendor of a noble interior.

The portico, for these considerations, should precede the discussion of the internal perfections in the description of a Temple. But the peculiar circumstances of this Temple are such as prove the symmetry could not be known previously to the demonstration of the general dimensions, fully discussed in the VIII chapter above, to which I beg leave to refer the reader:

The breadth of the portico, in the sacred text, is recorded at 10 cubits, and from the nature of the disposition of so lofty a portico, they must be understood of the primitive measure: then, to give the dimensions in English feet, the entire height from the pavement to the ceiling is, ft.218, in.10.56: the length, or front line, including the thickness of the side walls, equal, each, to a diameter of the columns, and $\frac{1}{2}$ a diameter for the projectures of the plinths of the angular stylobates; the length, I say, taken, on the pavement, is ft.177, in.10.08, and the breadth ft.72, in.11.52.

Taking the diameter of the columns at 7 little cubits, equal ft.12, in.9.216, and the symmetrical height
of

of columns at 11 diameters, equal to ft.140, in.5.376: and the stylobates on which they stand, at ft.18, in.2.88, these heights together taken from ft.218, in.10.56, the entire height, leave ft.60, in.2.304, for the entablature.

And the ordination thus; 6 columns at ft.12, in.9.216 equal to ft.76, in.7.296; and 5 intercolumns at ft.18, in.11.6352 equal to ft.94, in.10.176; and $\frac{1}{2}$ a diameter for the projectures of the 2 angular stylobates of ft.6, in.4.608: then ft.76, in.7.296 + ft.94, in.10.176 + ft.6, in.4.608 = ft.177, in.10.08 the entire length of the front line of the portico, as above stated, comprizing 6 columns in front. And between these and the front wall of the Temple, 6 columns also including the 2 metal columns in the middle, range with the 6 external ones, and when a $\frac{1}{2}$ of a diameter for the sally of the front stylobates is admitted into the line of the breadth, there will be, between the middle row of columns and the wall, a spacious walk of ft.22, in.1.302; and another of the same width between the front column and the middle row, in which the 2 metal columns, which Solomon named Jachin and Booz, stood, before the foldings of the entrance of the Temple.

Thus I have given the ordination, disposition and symmetry of the portico, before I enter upon the description of the molten columns, that the reader, by having the dimensions in English feet, might form some idea of the astonishing magnificence of this most noble portico; and come prepared to peruse the discussion of the metal columns.

If, however, any objection should be started against the unprecedented magnitude of the columns, which are more than 12 feet in diameter; I answer they are in the portico of a Temple of such amplitude and magnificence

nificance, as was intended, by the founder, to raise wonder and astonishment in the minds of all who should behold it! "For the house that I build shall be wonderful great!" Nor in fact were these columns much larger than in some of the Egyptian Temples, that at Karnac, Denon tells us, had columns in its portico 11 French feet in diameter, which, reduced to English, are nearly $11\frac{1}{2}$. And a column on a stylobate (*pedestal*) with the highest entablature admissible, cannot, on a much less diameter than that I have assigned to it, consistently with the rules of symmetry, rise to the height of 180 cubits, equal to ft. 218, in. 10.56: nor could there have been fewer than 6 in the front, without violating the laws of symmetry, which, in the species of intercolumns called pycnostyle, assign nearly what I make them: but if there were 4 columns in the front, the intercolumns would be 40 feet, which is considerably more than diastyle, or 3 diameters, and according to Vitruvius, inadmissible in work with stone epistyles.

In the subsequent discussion of the dimensions of the metal columns, we shall find it convenient to have the several measures above stated, in cubits, that being the Scripture measure. The length of the portico, taken at the plinths of the stilobates, 97 $\frac{1}{2}$ cubits: breadth 40 cubits: height of stylobate 10 cubits: height of column 77 cubits: height of entablature 33 cubits: diameter of the column 7 cubits: the intercolumn 10.4 cubits. The 2 spacious walks, in the portico, are each 12.125 cubits wide.

It is not impossible but that some may be displeased, who happen to observe that the authority of Vitruvius, a heathen, giving the characters of heathenish Temples, should

should be alledged in support of the ordination and disposition of any part of a Temple, dedicated to the name, and raised for the worship of the living God ; I beg leave to remind them that the conductor of the architectural department in that renowned Temple, was Hiram the Tyrian, who was sent for, by Solomon, on account, precisely, of his universal knowledge in the liberal arts of architecture, sculpture, painting and the secrets of the foundry, as practised by the Egyptians, and taught by masters versed in Asiatic magnificence. And the documents delivered by Vitruvius are clearly derived from the same schools, and can be traced to the same source.

In this majestic portico were placed, before the door (fores) of the Temple, in the middle of the inner row of columns, and elevated, like the marble columns, that accompanied them and completed the row, the two celebrated metal columns, called,

Jachin and Booz.

In the 1 Kings, 7 chap. 15 v. these columns exclusive of their capitals are recorded to be 18 cubits high, and 12 cubits in girth. And in 2 Chron. 3 chap. 15 v. also without their capitals, 35 cubits high.

Finding it altogether impossible either to reconcile these dimensions, in any acceptation of cubits whatever, while applied to one object ; or to discover two objects for the two dimensions : I sought in this perplexing difficulty, for a motive of preference, in the Scripture itself ; and in the 52 chap. of the prophet Jeremiah, I find the 18 cubits, recorded in the book of Kings, repeated, which I consider as one inducement to prefer that dimension ; and as the height of the portico is recorded

in the same book by cubits, that required the qualifying term of, *primitive measure*, to ascertain their true quantity; in all reason, the same qualification obtains in the dimensions of 18 cubits, which in the acceptance of the little or customary cubit, accords with nothing in the portico, neither in the disposition which I have assigned, nor in any other. But the height of 18 cubits of the primitive measure, which is equal to 4 times 18, and produces the height of 72 customary cubits, raised on a stylobate of 10 cubits, and the capital of 5 cubits added, exactly attains to the height assigned to the marble columns in the portico, as seen in page 140.

The girth of these is 12 cubits, and the diameter of a circle, 12 in the circumference, cannot be ascertained exactly: I have assigned 7 feet English, which is between 3.82 cubits and 3.84: though by Moëtius's proportion it is only 3.819 &c. The intercolumn in 7 feet diameter, the columns ranging with their centres opposite each way to the centres of the marble columns, which are in diameter 7 cubits = ft.12, in.9.216; the intercolumn, I say, or distance of one metal column from the other, is ft.24, in.8.8512: and the intercolumn, right and left, of the metal columns, equal to ft.21, in.10.2432.

The symmetrical proportion of these metal columns, when their capitals are on them, is 20 diameters and almost 4 minutes. This delicacy in the symmetry, in marble columns, would have the appearance of weakness and insufficiency to support the incumbent weight of the entablature; but, in the metal, between 3 and 4 inches thick, were more than competent to carry their burthen; which was probably the reason why Solomon expressed his approbation, in that respect, by calling *one*

One of them Jachin, which signifies stands firm, and the other Booz, viz, in it's strength.

But the most curious part of these metal columns, is the capital, concerning which there is some misconception amongst commentators. St. Jerome, in the book of Kings, calls the tops of the shaft capita, whereon the capitals were placed; and the capitals themselves, he calls capitella, which are said to be 5 cubits high. Now in 2 Chron. 3 chap. 15 v. he calls these capitals of 5 cubits high, by the term *capita*, and retains that term through the whole chapter. Commentators, therefore, collating these passages, and finding *capita* were called capitals, as well as capitella; and returning to the 1 Kings, 6 chap. 19 and 20 v. where we read "the capitella which were upon the capita of the columns were manufactured, as it were, in manner of a lily, of 4 cubits:" so far in 19 verse: then in the 20verse it is said, "And again other capitella from above on the summit of the columns according to the size of the column at the set work."

In answer to this, I perfectly agree with these commentators, that what are called in the 20 v. *capitella*, were placed before the summit of the columns, but that they were other capitals in their acceptation of the terms alia capitella, I must take leave to dissent from their opinion. No fulchrum is to be called a column before it receives a capital, but only the shaft or body of a column: but the capital being placed on any such fulchrum, it is then properly called a column: whatever, therefore, is said to be on the summit of a column, must necessarily mean on the top of the capital; and is that which Vitruvius invariably calls epistylum, when the work is of marble or other stone, and establishes, as

a general rule, a precept to reduce the soffit, or under part of the epistylum, to a breadth exactly equal to the diameter of the top part of the shaft ; to which also the under part of all kinds of capitals correspond, at their bedding joint, which joint is concealed from sight by the projecture of the astragal, a round moulding appearing to bind the upper part of the shaft.

Now what St. Jerome states, by the term *capitella*, in this 20 v. in the 6 v. of the next chapter, he calls *epistylia*. And that he means by this latter term the same as Vitruvius taught, is evident from his assumption of it. And that he intended the term *capitella*, in the 20 v. to be understood in the same sense also, I now proceed to prove, to the satisfaction of those who are sufficiently acquainted with the principles of architecture, to perceive the import of the above documents of Vitruvius. It is evident, then, the net-work, mentioned in the sacred text, was situated at the joint between the under part of the capital and upper part of the shaft, and the pomegranates were in the place of a carved astragal : therefore it is said, the *capitella* on high, over the summit of the column, were to be confined to the size of the column at the net-work, “*juxta mensuram columnæ contra retiacula* ;” and by this precept the *alia capitella*, are proved to be the *epistylia*. In reality, epistyles, in marble work, are as distinct things as capitals themselves : for each epistyle stands over each of the intercolumns, and they meet in joints on the centres of the capitals.

But, contend the commentators, the *capitellum* on the shaft of the column is expressly said to be 5 cubits high ; and a *capitellum* of lily work of 4 cubits, is described in the 19 v : therefore 2 capitals, one upon the other.

To

To this, I answer, that it is not said, in the sacred text, that the capital was 4 cubits high, but that a part in the capital was wrought in form of a lily of 4 cubits.

The whole 19 v. is; "*capitella autem, quæ erant super capita columnarum, quasi opere lilii fabricata erant in porticu quatuor cubitorum.*" These words literally mean; "but the capitals, which were upon the tops of the columns, in the portico, were fabricated by work as it were of a lily of 4 cubits." Here is no mention of the height of the capitals, but only of the size of that part of the fabrication that was something in form of a lily. And this I will venture to affirm is the meaning of the passage: and this it's form very nearly assimilates it to the ancient Corinthian capital, as improved by Callimachus, in the height of $1\frac{1}{2}$ diameter. The height also of this capital, both in the book of Kings, and 2 of Chronicles, is recorded to be 5 cubits, which is 1 diameter and a trifle more than $\frac{1}{4}$: the lily formed leaves, taking $\frac{2}{3}$ of it's height, leaves $\frac{1}{3}$ for the abacus and net work, at the bottom of the capital, over the pomegranate astragal, but under the leaves of the lily: and when it is considered that in the molten capital, to which the pomegranates were attached, and not to the shaft, that accounts for the excess of height more than in the Corinthian capital, whereto if the astragal, and fillet were attached, it would be also exactly $1\frac{1}{2}$ diameter high.

The symmetry of this capital, if even we had no other proofs, is sufficient to induce our belief that the style of architecture, called Corinthian, was not invented by Callimachus, but has it's epoch about, or even anterior to the building of the Temple; and that Hiram the architect and father of the King of Tyre had, doubtless, attained to that eminence in architecture, recorded in
Scripture,

Scripture, and in the history by Josephus, by frequenting those places, where the most splendid and magnificent structures had been raised, as Babylon, Thebes, and places renowned for the surprizing grandeur of their Temples and public edifices. And to such were the Athenians in after times indebted for their principles of architecture : and Callimachus did no more than devise a variation of the capital, so beautifully executed in leaves of the lily, by direction of Hiram.

Thus I have described the ordination, disposition and symmetry of a Temple the most majestic and magnificent ever heard of on earth. But who shall be able to describe the elegance, taste, beauty and perfection of the sculpture that graced every part of the immense capacity within ; throughout covered with animated representations of celestial cherubs, amidst the imitations of nature's choicest productions ; altogether an unbounded display of sumptuous grandeur, richly decked with the purest gold !

What was reported to the Queen of Saba, was deemed by her greatly too much to be believed : but when she came to Jerusalem and beheld the stately appearance of the Temple without, and all the majesty within ; the inexpressible splendor of such a glorious sight overpowered her senses : and after an involuntary pause, she thus spoke her astonishment ; "what was related to me O King of thy wisdom and thy powers in devising dignified magnificence, I thought incredible ; but now I am come and my eyes have beheld thy works, I have myself made proof, here is more than double the magnificence reported"

CHAPTER, XI.

IN the three preceding chapters the description is confined within the bounds limited by the sacred text ; including only such passages of Josephus's history, as either accord with the Scriptural narrative, or, at least, no ways run counter to it. But several observations occurred to me, as I proceeded, the insertion of which would have incumbered the description too much ; and might, in the minds of some readers, have tended to weaken the authority, rather than illustrate the meaning of the sacred text. It appeared, therefore, more expedient to offer those reflections to the consideration of my readers in a separate chapter.

The first observation I have to make, is, that the Scripture teaches not the perfect form and manner in which, we may imagine, the exterior of the roof and pediment were finished. All we can gather from Scripture is, that the whole Temple was covered with deals ; but the inside was lined with cedar, and gilt throughout. Whether these deals formed all the outward covering appears not. It was not the custom amongst the ancients, in hot countries, to cover their houses, or even palaces, with pitched roofs, but perfectly flat ; and at Rome, Julius Cesar is said to be the first who ventured to imitate temples, by a pediment-roof on his house : and it is well known that at Athens and Rome, temples had always pediments.

But whether all the first Egyptian Temples had roofs in the pediment form, is more than I can take upon me to assert. Yet, as mention is made in the new Testament, of the pinnacle of the Temple, then at Jerusalem, we may presume the first Temple also had the same form ; which I conceive means the ridge, or the

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acroter

acroter placed on the ridge of the pediment. . But these pediments were at first, amongst the ancients, made very flat. The deals were probably covered with thin stones prepared by masons, and wrought down very thin at one edge. What leads to this conjecture is, the money, mentioned in the 2 Kings, 12 chap. collected by order of Jehoash the king, for the repairs of the Temple, was paid principally to carpenters and masons, by which I conceive it was the roof that was repaired*: for such were the stones, that composed the walls above 12 feet thick, as to leave little probability of their being injured. But as I am now unable to procure all the information I could wish; I pass to the next consideration, the

Entablature of the portico; whereof the symmetrical height I have represented to be 4 diameters and about 43 minutes; which is much more than twice the height allowed by the best of modern architects: and double of any entablatures found in the Greek or Roman antique. However, I take to myself neither commendation nor blame, in having the 33 cubits for the height of the entablature; for neither the moderns, nor the antique remains, nor my own judgment are consulted, but inferences are drawn from the sacred text, to prove that it must have been about that height. And the only liberty of deviating, is confined to the height of the stylobate, or pedestal, and that in a very small degree. I have taken for the die of the stylobate, the least height of the two dimensions of stones recorded for that purpose, 1 Kings, 7 chap. 10. v. "Foundations of costly stones, great stones of 8 or 10 cubits." But

*In the Vulgate the words are *Sarta tecta*, which indicate a repaired roof.

if that of 10 cubits be assumed, and the increased height of stylobate be subtracted from the 33, there still rests 31 for the entablature; equal to 4 diameters and something more than 25 minutes: and, to procure this reduction of the height, the stylobate, even with the same base and cornice, will be 12, instead of the 10 cubits, which I have assigned to it. And the columns must be confined to the height of the metal columns, viz, 77 cubits. It only now remains to account for this extraordinary symmetrical height of entablature, equal, in absolute measure, to 33 cubits of Cairo.

But, though I undertake to shew the purpose of such an excessive height of entablature, which Hiram was fully aware of, when he designed that portico; I by no means pledge myself to defend it. And whether the reasons that induced Hiram to adopt such a symmetrical height, or those which shall be adduced against it, are best; is a decision submitted to the judgment of the learned.

We are informed, then, from Vitruvius, that those artists whom he styles his ancients, had a rule of optics, of which they were extremely tenacious; that all objects, with the natural size whereof we are familiar, are always to be enlarged, in proportion as they are more and more elevated above the eye of the beholder. Thus if the statue of a hero, of a common stature, be placed on a pediment 2 or 300 feet high, it was to be made of 9, 12, or 15 feet in height, that it might appear to the eye of statue 6 feet high.

Hence, Vitruvius, embracing this rule of optics, regulates the heights of epistyles over columns, by which the frieze and cornice are also regulated, by the greater or less height of the column: and the proportion he es-

tablishes, is, in columns from 15 to 20 feet high, the whole height of the column is to be divided into 26 parts, and 2 such parts are to be assumed for the height of the epistyle, called architrave: from 20 to 25, to be divided into 25 parts, and 2 such to be assumed: from 25 to 30, divide into 24, and assume 2: from 30 to 35, divide into 23, and 2 such: and so on, till we come to the height of the column in question, which at present is 77 cubits elevated on a stylobate of 10 cubits more, which furnishes an elevation of 87 cubits, equal to ft.158, in.8½. Now to pursue the ratio to 150 feet only, we are, for 50 feet, to assume 2 twentieths; for 100 feet, 4 twentieths; of course, for 150, we are to assume 6 twentieths, for the height of the epistyle; which is equal to 45 feet, about 24 cubits and 2 thirds; and when the freeze and cornice are added, the entire height of the entablature might have been, according to this notion of optical effects, even above 60 cubits high: therefore the 33 cubits assigned by Hiram, must be allowed by the advocates for this optical rule, to be a very moderate height.

Now, although Hiram did not, in this notion of optics, go to the length, to which the rule, laid down by Vitruvius, would lead; yet what I shall take the liberty to call the excessive height of his entablature, clearly proves he was governed, like the rest of the primitive ancients, by some similar principles of optics.

To combat an opinion, which is supported by the authority of all antiquity, may, by some, be deemed bold and rash. But in concerns merely of human science, if reason and experience be on our side, we need not fear but truth is also. All architects must allow, that an entablature about 2 diameters of the column in height

height, and viewed in a picture wherein the eye takes in the whole design, will appear in good symmetry. If, then, a person be imagined to stand 4 or 5 yards from the columns of the grand portico, (the subject of the present disquisition,) and look up to the entablature, he would judge that entablature to be scarcely two of the diameters of the columns beneath; because the angle formed by the lines, one from the top of the entablature to his Eye, and the other line from the bottom, would be very small, in such a station: but let the person be imagined at 100 yards distance from the portico, he would then perceive his mistake, would correct his former judgment, and discern it's real height. One argument, therefore, grounded on such an experiment, is sufficient to expose the erroneous principle of this ancient notion of optical effects. For surely it is little short of absurdity, to consult an apparent perfection, beheld in two or three stations, which, in 10 000 others, would exhibit a real deformity. In one word, we may safely assert as an axiom, that our eyes, duly disposed, that is, neither distempered, nor their natural power impeded by wrong mediums, nor by prepossession, nor fear, never deceive us. An object, the size whereof we habitually know to be 6 feet high, when seen on the top of an edifice, in the apparent height of one foot does not deceive us; because, from constant experience, we know that the elevation it is in, is the real cause of the diminutive appearance: on the other hand, if in that elevation it should appear to be 6 feet high, we should know it was a colossus. Hence, the conclusion is against the principle of changing the size of objects to consult optical effects. I have treated of this subject more at large in the *Gent. Magazine* for the year 1801: 2 part page 1179. No. VII.

seq

See also Pertault's 5 orders of columns : englished by Mr. James, part 2, Chap. VII.

I have next to observe, that in the Scriptures there is no mention of bases to the columns, though the capitals are so distinctly described. And I much question if there was any thing more under the shafts of the columns, than the stylobates, called, in the sacred text, foundations. Because if there had been bases, their plinths projecting on each of the four faces, according to Vitruvius, $\frac{1}{4}$ of a diameter ; and an invariable law of symmetry requiring the dies of stylobates to project equal to the plinths of bases ; the diameters of the said dies, to which I assign no more than the column's diameter, viz. ft.12, in.9.916, would be ft.19, in.1.824 : and, when the projectures of the bases of the stylobates are added, the space for a passage between them would be no more than 6 feet ; which not being $\frac{1}{2}$ a diameter of a column, is out of the question to suppose. Moreover, the great height of the stylobates, being above 18 feet, rendered bases superfluous ; as the projectures of the cornices of the stylobates, would totally hide them. The next thing I have to notice, is the manner in which light was admitted into the Temple. The galleries, that were all round, at the height of 60 cubits, ascended by the continuation of the winding stairs, that led to the censeles, must have occasioned the window-sills to be 2 or 3 cubits higher than their floor ; it may be, that they were even much more elevated, and the light from the right side would be received under the gallery on the left, and vice versa ; as described in Egyptian halls. And the beautiful sculptures that adorned the sides of the Temple, would appear to the greatest advantage in a light so admitted. And, from that oblique direction

rection of light, the windows are expressed in the sacred text, *fenestras obliquas*, in distinction from the customary situation of windows, on a near level with the eye ; the best, no doubt, for seeing external objects, but the very worst for discerning the perfection of objects within inclosed apartments.

Concerning the winding stairs, I have to observe, that on their account the wall must have been about the thickness I have assigned to it ; for we cannot suppose less for the length of each step than about $4\frac{1}{2}$ feet, nor less than 1 foot for the *puel* ; 10 feet, then, for the diameter of the stair case, leaves but ft.1, in 4.608 of thickness of the wall, inside and outside. I pretend not, these are the exact dimensions of the stairs, but they were, the text informs us, winding, and contrived within the thickness of the wall, which therefore must have been nearly 13 feet thick. And, if we suppose each step, or *air*, to have risen about 6 inches, the ascent to the gallery of the middle *cenacles*, comprized 73 steps ; the time to the next *cenacles*. But from the pavement beneath, to the landing on the gallery within the Temple, there are 219.

As all Temples had steps before the portico, we may conclude this Temple, so superior in magnificence to all then existing, was not without them ; and that they were continued throughout the circuit of the *cenacles*. And the reason the Holy Bible is silent in that particular, might be, that the prevalence of the custom, rendered the insertion unnecessary : for it mentions not steps even to the brazen altar, no doubt because indispensablely necessary.

I now proceed to the other objects, that belonged to the Temple, but were not deposited within it. And first,
The

The Brazen Altar.

This altar, 2 Chron. 4 chap. is said to be 20 cubits long, 20 wide, and 10 cubits high ; in English, ft.36, in.5.76 square, and ft.18, in.2.88 high ; of course it was ascended by steps: This altar was erected before the front of the Temple, at a distance from the portico : and though so extensive, was not equal to the number of oxen, that were offered and burnt in sacrifice at the dedication ; and Solomon had the atrium of his palace, sanctified for the occasion, wherein to burn the victims, which the brazen altar could not contain.

The Molten Sea.

The sacred text gives a very minute description of this piece of workmanship, in 1 Kings, 7 chap. and 2 Chron. 4 chap. The dimensions are stated at 10 cubits in diameter, and 30 cubits in girth. This is one, out of many other instances, that proves the holy Scriptures do not always relate matters of human science, conformably with the rules or conclusions drawn by schoolmen ; but consult rather the received notions and habits of the multitude, who, in this particular case before us, usually assume the third part of the girth of any circular object, for it's diameter. Many use this method, and deem it a true rule, who never heard of Mostius's proportion, nor the still nearer approach to reality of proportion, by Van Culen.—And again, if we take the depth, which is given at 5 cubits, as an inside measure, the form of the vessel will be in the form of $\frac{1}{3}$ an egg, rather than of $\frac{1}{3}$ a sphere : for the thickness of the metal is said to be 1 palm, about $3\frac{1}{2}$ inches, or, 3.648 inches ; twice this, taken from the diameter of 10 cubits, there rests about $9\frac{1}{2}$ cubits ; but in feet exactly ft.17, in.7.584, the diameter, inside measure : and from the depth 5 cubits

cubits take one palm, and there will rest cubits 4.8339 &c, in feet, ft.8, in.9.792. Whoever first recorded the dimensions of this surprizing and ponderous vessel, was probably more accurate in the diameter, than in the girth, that being more easily taken. To assume, then, the diameter of ft.17, in.7.584, and admitting the vessel to have been a true hemispherical hollow, it was capable of containing 8793 gallons, 2 quarts, and 1 pint, English beer measure. It is also found that the metal used in casting this sea, when cubed, was equal to $153\frac{1}{2}$ cubic feet, equal to $5\frac{1}{2}$ cubic yards; besides 19 oxen, cast also in brass, on the backs whereof this molten sea was placed. As this vessel, called a sea, was the most astonishing performance Hiram devised, I have taken the pains to calculate both it's capacity, and also the quantity and weight of the brass of which it was composed. In doing which I have taken the diameter from out to out at 10 cubits of Cairo equal to ft.18, in.2.88: and the inward diameter, as above stated, which gives to the palm 3.648, this taken from the thickness, there will be found 965479.4430 cubical inches of brass: and from an authority upon which I can rely, the specific weight of a cubic inch of cast brass, is equal to 4.6303 ounces avoirdupois, by which the entire vessel is found to be tons 34, cwt.5, qrs.3, lb.94.

The station in which this molten sea was placed, was on the right side of the Temple, facing the east, on the south station; so as to make a triangle with the corner of the brazen altar and the south-east angle of the portico. The 19 oxen, cast also in brass, were the apparent supporters of the sea, but it's real support was a stem or low pillar under the centre, and the hind parts of the oxen were turned to the pillar; the oxen were

U

disposed

disposed in 4 divisions beneath the sea; 3 oxen looked to the east, 3 to the north, 3 to the west, and 3 to the south: and in the 4 angular spaces were various devices in sculpture, and steps (it is presumed) to ascend to the rim of the sea. All that the Scripture teaches as to the end of this immense vessel, is, that the priests washed in it. If by this is meant, that they bathed in it, it must have had steps contrived within. The great difficulty appears to be, how such a quantity of water was conveyed to the vessel and discharged, when it became foul and fœtid. Besides the molten sea, there were

Lavatories supported by Bases.

The bases mounted on wheeled carriages, in number 10, cast in brass, and the whole curiously put together, are described circumstantially in the sacred text: the lavatories placed on them, were for washing and cleansing the entrails of the victims, that were to be burnt on the brazen altar. Each lavatory is said to contain 40 baths, which, if the sea contained 2000 baths, equal to 8793 gallons, the 40 baths were equal to 175.86 gallons. The bases, on which these lavatories were placed, are recorded to be 4 cubits square, and 3 cubits high, in feet ft.7, in.3.552 square, and ft.5, in.5.664 high.

Josephus, or rather his translator, tells us this immense molten sea, mounted on it's 12 oxen, wherein the priests washed their feet; and the 10 bases with their lavers, wherein were cleansed the entrails of oxen to be burned afterwards on the brazen altar; were all deposited within the Temple!!! And under such an idea, the Temple would be more assimilated to a filthy slaughter house, than to an august basilica and atrium so beautifully adorned in every part, with all the sumptuous
splendor

splendor, that the purest gold and rarest marble could exhibit! Besides the incongruity of the association, of the most elegant throne in the world, of a golden table for the shew bread, and 9 other most richly ornamented tables, all the golden candlesticks and innumerable golden vessels, with a gigantic bathing sea and washing vessels for cleansing filthy entrails; to say nothing of the quantity of space, such objects would have occupied, and the offensive stench they would have occasioned in the Temple. The idea, surely of such deposits within the Temple, is repugnant to common sense, and to the sacred Scriptures, which, throughout the whole description in the book of Kings and 2 Chronicles, have not a word to countenance such a conclusion: nor do I think Josephus so expressed himself, in the original. In the 1 book of Kings (alias the 3) chap. 7, v. 39, St. Jerome has the passage thus: "*Et constituit decem bases, quinque ad dextram partem templi et quinque ad sinistram: mare autem posuit ad dextram partem templi contra orientum ad meridiem.*" In English literally: "and he established the 10 bases, 5 at the right-hand part of the Temple, and 5 at the left; but the sea he placed at the right-hand part of the Temple, opposite the east, to the south."

Now the circumstance alone of describing the station of the molten sea by the cardinal points, both here, and where the oxen are described, sufficiently indicate these things were in the open air. Besides, what a degrading notion is it, to imagine the entrails of beasts, too filthy to be laid on the pile, that was to consume them, were carried into the Temple in their foul state to be washed: and that the priests first went into the Temple to wash their dirty feet, and then came

forth to offer burnt victims on the brazen altar without.

I have rested thus long on this particular, because absurd as the notion is of such deposits within the Temple, Josephus is made, by his translators at least, to have held it: and plates are published, wherein the molten sea is placed on one side, within the Temple, near the screen of the oracle, with the heads of three brazen oxen turned to it.

Josephus says, the table for the shew bread was of solid gold, on the nine other tables were placed 20 000 vessels and cups of gold; and 40 000 of silver: 12 000 candlesticks; and a golden altar in the oracle. 80 000 wine cups, 10 000 goblets and other vessels in gold, and 20 000 in silver. Also 20 000 of golden measures called the mosaical Hin and Assoran, and 40 000 of the same in silver: 80 000 golden dishes and plates for steeping flour in, upon the altar; and double that number in silver: 20 000 golden censers for incense; and 50 000 other censers for conveying fire from the great altar to the smaller altar. He says the edifice was environed with a double cloister, supported by 2 ranges of columns, each of one entire stone. These cloisters were wainscoted with cedar, the doors were composed of silver, and the roof was fret-work.

Of these cloisters, as he calls them, as neither their distance from the Temple, nor any of the dimensions are given, nothing can here be said.

If the reader will turn to the 1 Chron. 22 chap. 14 v. and 29 chap. 4, 6, and 7, v. he will find there such treasures of gold, such quantities of silver and brass, as will reconcile his mind to credit the account Josephus gives of the above statements of gold and silver vessels. He also gives an account of great numbers and variety of priestly vestments.

In

In addition to the description of the ordination and disposition of the basilica and atrium, as given in 9 chap. 135 p. I have to observe, that, although the sacred text, and what is gathered from Josephus, authorize no more than 1 range of stone or marble columns in the atrium and basilica, supporting the spacious gallery all round; yet to adhere to the propriety of an architectural disposition, we might be led to conclude, there was a second range of columns in the galleries all round, directly over the columns beneath, in the disposition of the columns, described by Vitruvius, in a hypæthral Temple, wherein they are double in altitude: serving in such a disposition both to shorten the bearings of the cedars that form the roof, and also to contribute greatly to the beauty and grandeur of the design. And though not hypæthral, like the heathenish Temples, would receive abundantly light enough from the side windows.

When we contemplate the unparalleled magnificence, the rich and sumptuous ornaments diffused through the whole and every part of that majestic structure; can we refrain from execrating the memory of the arrogant King of proud Babylon, who gave the unhallowed command for it's total destruction, after having existed above four centuries, the admiration of the universe!

It is said some of the Jews who had returned to Jerusalem, from the Babylonian captivity, lived to see the completion of the second Temple; and when they entered it, and saw how much its splendor fell short of the majesty, the richness, and admirable magnificence of the former Temple, they are said to have dropt a tear.

CHAP.

CHAPTER XII.

THE CANON OF SYMMETRIES, FROM THE BOOKS OF
VITRUVIUS, AS PUBLISHED BY JOCUNDUS, THE WHOLE
DIVIDED INTO TEN SECTIONS.

SECT. I.

What Grecian Architecture is.

THE true Grecian architecture, which the following sections are intended to depict, has often sunk with states and empires into temporary oblivion, and been restored again with it's unabated excellencies, which have, through a lapse of near 4000 years, still arrested the attention, and engaged the admiration of mankind, as often as they have been revived.

"The study of architecture, says Mr. Roscoe, in the life of Lorenzo de Medici, 2 vol. 294 p. as revived by Brunelleschi, received additional support from the encouragement afforded by Lorenzo de Medici, who, to the munificence of his grandfather, superadded a knowledge of this science equal to that of a practical artist. At his instance, and often at his individual expence, the city of Florence was ornamented with a profusion of elegant buildings, as well for private residence, as public purposes. Convinced that the art was founded on fixed and determinate principles, which were only to be discovered in the labours of the ancients, he justly reprobated those professors, who, neglecting the rules of Vitruvius, followed only the variable suggestions of their own fancy. Nor was he less severe on those, who, without any previous knowledge of the art, conceived themselves equal to the task of conducting a building on an extensive scale, and, in the erection of their dwellings, chose to become their own architects. Such people

people, said Lorenzo, buy repentance at too dear a rate."

This censure, of Lorenzo de Medici, on those who in his days, neglected the documents of Vitruvius, may justly be extended to the conduct of other architects, especially to that of Perrault; who, after a hasty perusal of the writings of Vitruvius, have published their own misconceptions of his rules, and of his definitions and essential principles, as the sense of the text. Hence, in our churches, halls, grand saloons, and other inclosed places, we see columns with their entablatures, pretended to be designed and proportioned according to the rules prescribed by Vitruvius, from the Grecian architecture; but which in reality are wholly foreign to his prescriptions, and exhibit a massive heaviness disgusting to the sight, and highly disparaging to the reputation of the Grecian style: while the expence, to the owner, is, at the same time, increased by a third of the quantity of wood or stone, more than necessary.

The Athenian and other Grecian architects, were attentive to this particular, and though Vitruvius has twice introduced the rules, by which inside columns are to be regulated, and their degree of delicacy ascertained, they have been neglected, and not even understood by the moderns; as will be fully proved in Sect. 6. In proportion as this erroneous practice of erecting inclosed columns, in the same commensurate, or, symmetrical height and diameter, as external columns, has injured the reputation of the Grecian style of architecture, so it has occasioned a more free and general admission of the Gothic style; which many, of late, appear even solicitous to revive. We know the impression which the lofty magnificence of a few paragons in this style, yet
existing

existing, make on the mind, when we enter these venerable remains, and behold the imposing aspect of grove-like aisles, in stupendous altitudes, supporting immense ramified arches, all crowding at once on the imagination. Discernment, is here bewildered ; surprize is mistaken for pleasure ; and our agitated spirits, preventing deliberate reflection, seem to persuade us, we approve of all we see. Hence such encomiums on the Gothic style, while the ill fated Grecian architecture, is deprived of it's still more favourable effect, by having fallen into the hands of practitioners, inexperienced in the powers of it's perfections and captivating elegancies.

Mr. King, in his preface to his 1 vol. of his *Munimenta Antiqua* p.15, alludes to the effect of the Grecian rules, as imperfectly known to the moderns, and exemplified in the Roman antique, but could not, surely, mean, as taught by Vitruvius. With this proviso, the passage finely expresses what I had long since conceived, before I had the pleasure of seeing his curious, laborious and valuable work. I shall beg leave to transcribe it in his own words. "The gloomy mansions of Saxon and of Norman days, strike the mind oftentimes with awe and reverence—But however wondered at, they cannot often be sincerely praised ; nor be compared with the admired elegance of Grecian and Roman structures. They have, however, frequently such a rude sublimity of thought and design, manifested in their architecture, as produces uniformly, an effect upon the mind, far surpassing any ideas of grandeur, that could possibly be excited, by the more regular rules of Grecian art, even when aided by Roman greatness." This conclusion, made by Mr. King, may pass as indisputable, amongst modern practitioners, and the adepts in

in the school of the Roman antique. But there exists not, perhaps, in any nation, a structure of an internal amplitude and capacity, equal to York minster, and decorated in the Grecian disposition and symmetry, assigned by Vitruvius for inclosed places. The regular rules of Grecian art, have never yet, on such occasions, been put in practice ; and of course their effect cannot be ascertained with such precision, as to warrant the assertion, that *they could not possibly excite ideas of grandeur*, equal to that experienced in our paragons of Gothic art. The Greeks displayed the magnificence and grandeur of their Temples principally in the ranges of noble columns in the circuit of the external walls, where the symmetry expressed a majestic solidity : yet they were not unacquainted with symmetries appropriate to inclosures.

Let any gentleman, familiarly acquainted with Vitruvius's symmetries for external columns, imagine Corinthian columns in the very height those Gothic clusters are erected, raised on stylobates; and disposed in ranges, as now the clustered columns are, not in the masculine symmetry of 10 diameters high, but their thickness reduced so as to produce $12\frac{1}{2}$ diameters in the same absolute height, with their entablatures proportioned by the reduced diameter, and surmounted by semicircular arches with appropriate enrichments ; and I am bold to say, his judgment would be corrected, if before he thought with Mr. King, that the rules of Grecian art could not produce an effect of grandeur, equal to such Gothic or Norman sublimity.

The Greeks, it is true, knew nothing of the improvement their designs might receive from the later invention of architectural arches : this circumstance gave the in-

ventors of what is called Saxon and Norman architecture a temporary advantage over the Grecian style, which, together with the suppression of the more delicate Grecian symmetries, so manifestly taught by Vitruvius, inspired a general approbation of those airy and lofty symmetries, still seen in many astonishing piles both in this and other nations : but bring down these lofty columns to 9 or 10 diameters, to assimilate them to the symmetry of external Grecian columns, and the charm would be dispelled, the fascinating sublimity would cease to impose on the beholder's judgment, which, freed from surprize, would be at liberty to discern the unmeaning profiles, the rude and unnatural devices throughout every part of it's composition.

I am not, however, engaged to expose the defects of the Norman style, or other Gothic productions, but to combat the errors introduced into the Grecian architecture by the commentators on Vitruvius. And the subject of this present section is, what the term architecture means: or rather what the things are which are comprized under this denomination. For logicians maintain there are certain first principles, which, being self evident, cannot be demonstrated: and I hope I shall not be thought to trifle, if I, for the same reason, say architecture cannot be defined; since a definition should be more perspicuous than the term to be defined.

They who define it to be the art of building, had better have said nothing, since by common consent the term *architecture* includes much more: and indeed by such a definition the building of a hut, by a peasant, with clay-plastered hurdles and thatched covering is architecture, and the poor peasant skilled in nothing else, is yet an architect. And whatever other expressions

sions are used for this purpose, there will always be too much, or too little said for a true definition.

We must be contented with a description of what is to be understood by the term architecture : it's etymon is clearly Greek, and by no writer has it's description been more justly given, than by Vitruvius, who, 1 chap. 1 book, says "architecture is a knowledge improved by various and learned documents, by which the merits of all works of other mechanic arts are decided : it's nature being both mechanic and demonstrative." And again 2 chap. *ibid* : he says, "architecture consists of ordination, disposition, eurythmy, symmetry, decorum, and distribution." This said, he immediately proceeds to give their respective definitions.

"Order, expressed by the Greek word *taxis*, is the minute measurement of the members of a work singly, and the contriving of the proportion throughout, so as to quadrate with symmetry. And herein our business is with quantity, called in Greek *posoles*. And quantity is the result of modules, of a size determined by something belonging to the work itself, and a commensurability between every part of the members and the entire work."

This definition of order, is censured by Perrault, and by some others, as obscure ; which justifies what I advanced in my preface, that erudition alone is insufficient to understand the documents and definitions read in Vitruvius, who has here defined order strictly according to the rules of logic. And these learned commentators perceived it not, partly from prepossessions that biased their discernment, and partly from misconceptions of the import of certain architectural terms ; for certainly, *Modica membrorum commoditas, separatim,*

is a generical position perfectly intelligible to any latin scholar; but, *universæque proportionis ad symmetriam comparatio*; which, as a species of the preceding genus, and the completion of the definition, must appear obscure indeed, to the most learned, without a previous knowledge of the import of, *symmetria*.

But the obscurity Perrault complained of, in common with most of the moderns, was occasioned, not from any deficiency in the definition, nor from his ignorance of logic, but from his previous assumption of the term, order, for a purpose and meaning altogether foreign from the mind of Vitruvius. For he and the moderns have injudiciously usurped the term order, to express, under one idea, all the six constituents of architecture, instead of discriminating it, with Vitruvius, from the other five. Thus they profess to write of the Corinthian or Ionic, or Doric order: and give treatises on the five orders of architecture. And when they attempt to define an order, in this acceptance, they have recourse to the definition of Vitruvius, which being absolutely subversive of their purpose, they complain of it's obscurity. But the truth is, his definition is perfectly correct and logical: but their usurpation of the term, for an order of architecture, or the five orders as they call them, is, in reality, errant non-sense, and ought to be exploded.

Vitruvius next defines Disposition "the proper placing of things, and an elegance in designs, suitable to the quality of the work." He tells us the species, in this definition, is tripartite, and called by the Greeks ideas, viz, orthographic designs, scenographic and chonographic. Barbaro was of opinion that, scenographic, should have been written, sciographia, as this last word would

would better express a section, which he deemed more essential in designs, than scenographia, which signifies perspective. But since Vitruvius required an architect to be accomplished, in almost every branch of science, I cannot think he excluded perspective: and admitting that sections are essential, there is no probability of a learner becoming an adept in designing ground plans, and elevations, without perfectly understanding the nature and utility of sections. There can be no doubt therefore, but Vitruvius wrote scenographia.

These three modes of disposition, are what constitute it's essence; and are all expressed under the term designing. Hence, Donatellus, a celebrated statuary mentioned by Pomponius Gauricius, used to say to his pupils, he should teach the whole art of carving by a single word, viz, design. And Gauricius conceived the perfection of designing depends on symmetry and perspective. But Vitruvius attributes it to thought and invention: thought, he says, is a studious, unwearied, close attention engaged by the pleasure found in the subject: and invention is the elucidating of obscurities and the demonstrating of a discovery with a flexible vivacity.

Eurythmy is an appearance of beauty, and a certain harmonious aspect in the construction of parts. "*venusta species, commodusque in compositionibus membrorum aspectus.*" As when the members of a work, continues Vitruvius, are commensurate, as the height with the width, and that with the length, and in one word, when every thing has it's proper symmetry and all is commensurate with the entire work.

"Symmetry, again, is commensurability existing in the members of the work itself, and assigning, amongst the members, the rate each separately is to have, to answer

swer the aspect of the whole design. As symmetry in the human body is discerned from the elbow, the foot, the hand, the fingers and the rest. Just so in accomplished designs of buildings. And first of Temples, the rate of their symmetry is found by the diameter of their columns or by a triglyph." So far Vitruvius.

Whoever attentively compares these definitions of Eurythmy and symmetry, must surely discern the former to be of a nature to convey information by the sight; the latter, by documental rules: it must be perceived, eurythmy is the object of the imagination impressed with the effects of symmetrical observation; but symmetry itself, the object of the understanding: aided by the recollection of the effect of practical rules. A person, thus experienced, conceives pleasure when he beholds a building, as a Temple, wherein the rules of symmetry have been exactly observed: but when symmetry has been neglected, no eurythmy can exist in such a structure, and the sight of it will give little or no pleasure. It may be said, eurythmy, being the result of a just symmetry, supersedes the necessity of two distinct definitions; and this would be true, if the pleasure raised in the mind by eurythmy, inspired, at the same time, the knowledge of the rules by which that effect is contrived.

Perrault's objection against two definitions, alledging he knew of no word in French to express eurythmy, but proportion, and his conclusion of symmetry also under the same denomination, are fallacious. For it is not necessary to alter the figure of the word eurythmy in French, any more than many other terms of art which are purely Greek, but perfectly understood. Again, he tells us he could not use the term symmetry, because the French mean by it a parity of figure and form, viz. when
one

one side of any thing is made like the other; "but Vitruvius and the Greeks mean by *symmetria*, the relation a great integer has to it's parts, for example, they say a statue 8 feet high, is in the same proportion with one of 8 inches high, when the head of the former is 1 foot, and of the latter 1 inch." And this would be true, if the head of the former had been 2 feet, and of the other 2 inches, but nothing of symmetry in either. The truth is, Perrault here forgot himself, and improvidently brings an example, to illustrate the nature of proportion, which proves it not to be symmetry. Certainly the example to illustrate the position adduced, viz. the relation any great integer has to it's parts, should have been, when a statue of 8 feet high has it's head 1 foot, it's hand, it's foot, it's fingers, so many inches, &c. and this is Vitruvius's meaning of symmetry. In fine, Perrault, by confounding the terms symmetry and proportion, obscured the definitions of Vitruvius, and then complained of the confusion he himself had occasioned.

Proportion may be said to adequate parts to the whole, and to each other, by a similarity of ratio, by common measures and multiples. But symmetry does the same by appropriate and arbitrary measures or divisors, without any regard to ratios. Proportion has it's principles from nature, symmetry from art: the operations of the former, are invariable, fixed and certain; of the latter, they are mutable, dependent and customary: the one is resolved into evidence, the other into the authority of temporary precedents. Hence, I cannot but be surprized that a man of Perrault's erudition should have attempted to confound two things of so distinct and different a nature.

Vitruvius

Vitruvius proceeds next with decorum and distribution. "Decorum is a correct aspect in the work, and the constituents of a design warranted as to character, custom and nature, as when Temples where either Doric, Ionic or Corinthian to suit the quality of the Gods to which they are dedicated. Again to answer the interior magnificence and splendour of a structure, the customary elegance and majestic elevation is assigned to the portico, where a low and mean approach would be indecorous; as also to dispose denticules over Doric epistyles; or triglyphs over Ionic. And natural decorum is consulted, when wholesome situations are chosen, when chambers and libraries face the east; baths and winter apartments, the west; galleries for pictures, jewellery and curious sculptures &c, the north, as these objects require an invariable and steady light."

"Distribution is the due allotment of materials to the site, and a discreet frugality to confine the expensiture to the estimate. As when the architect seeks not for materials which can only be procured at a great expense. For pit-sand is not every where found, nor stone, nor fir, nor pine-tree, nor marble; some abound in one place, some in another, and the conveying them is often troublesome and expensive: for want, therefore, of pit-sand, use river or sea-sand well washed. When fir and pine-tree are not in plenty, the cypress, poplar, elm and pine must be used." (There are 2 kinds of pine, 1 called sap-pinus the other pinus, the latter is classed with the elm, the former with the fir.) "But there is a different kind of Distribution," continues Vitruvius, "when structures are required to be designed in a noble and grand style for men of family and great fortunes, and dignified nobility; for princes and ministers of state &c."

Thus

Thus has Vitruvius defined the six constituents of architecture : which Perrault, by confounding symmetry and eurythmy with the term proportion, reduced to five. And Sir Henry Wotton, who is frequently more facetious than accurate, thought the two first unnecessary, and the four last sufficient to assist in deciding the merits of any building. As if Vitruvius had transmitted documents for criticising the works of this noble art, instead of rules for erecting them. The Patriarch, Barbaro, has taken great pains to elucidate these six definitions of Vitruvius with a success equal to his industry, but is rather too prolix. He perceived the necessity of rightly understanding them, and begins his elaborate discussion with these words, "*Chiunque intendera bene il presente capo, con verita potra dire sapere, et indendere in che consista la forza dell'Architellura.*"

But before I proceed to the further discussion of symmetry as a principal constituent of architecture ; it may be convenient to observe, we have not in our language, any more than the latins had in theirs, a proper epithet expressive of the true and exact meaning of the Greek *συμμετρες* but substitute for it, commensurate, as the latins did *commensus* for the substantive *symmetria*, and the latin epithet *conveniens*, for our commensurate; yet we say a building is finely proportioned, because we cannot term it, finely symmetried nor finely commensurated ; Vitruvius, therefore, as well as we, frequently uses the term proportion, not in it's geometrical sense, but to express the sense of commensurability or symmetry. It seems, the want of this discrimination led Parrault, and some others, into the erroneous persuasion of symmetry and proportion being synonymous.

Proportion, however, in it's geometrical sense, though not a constituent of architecture, has as much to

do with it, in the progress of perfecting designs, as it has with other branches of science. And, though it is not symmetry, it is of indispensable use in discovering and even proportioning symmetries. For example ; if an entablature, having it's symmetries adjusted as Vitruvius directs, from an epistyle half a diameter, or 30 minutes, high, is found to be 1 diameter and 19 minutes high ; what must be the height of an epistyle to produce just 2 diameters for the height of the entablature ? Here we are to proceed by the rule of proportion, and state the question thus ; as 79 minutes : 30 :: 120 : 45.569 &c. the answer. And in the ordination of a Grecian Temple on a given front line, the practitioner must have recourse to proportion, and other rules of arithmetic.

The canon of symmetries begins with stylobates commonly called pedestals, under which term, the *scamilli impares*, present themselves for discussion.

SECT. II.

Of the Scamilli impares.

TO give as much perspicuity, as possible, to the discussion of the *Scamilli impares*, which many learned and ingenious commentators have, in vain, attempted to explain, as Bernardinus Baldus, Philander, Barbaro and others, it is necessary to describe the object which is to receive them.

The platform, then, on which Grecian Temples were erected, was ascended, in front, by a flight of steps, whereof the number, which was always odd, depended on the will of the owners, or of the architect. These steps were sometimes continued on every side, but when only in front, then the other three sides of the platform were

were finished, from the ground to the bases of the columns, in the manner our workmen conceive a continued pedestal; and between the columns, above it, are a kind of parapet ballustrades to which Vitruvius gives the name of podium, and the Italians, pozuolum. And here he says, "Sin autem circa ædem ex tribus lateribus podium faciendum erit, ad id constituatur, uti quadræ, spiræ, trunci, coronæ, lysis, ad ipsum stylobatam, qui erit sub columnæ spiris convenient. Stylobatam ita oportet exæquari, uti habeat per medium adjectionem per scamillos impares, si enim ad libellam dirigetur, alveolatus oculo videbitur; hoc autem uti scamilli ad id convenientes fiant, item in extremo libro forma et demonstratio erit descripta." In English thus,

"But if there is to be a podium on the three sides of the Temple, the rule is to be, that the plinths, bases, dadoes, cornices, parting, shall be in the same symmetry as the stylobate itself (pedestal) under the base of the column. The stylobate must be so *got out*, as to have an addition, by unequal scamilli, in the middle, for if wrought by a level, it will look like a trench. Now this shall again be explained with a figure at the end of the last book, that the scamilli may be adapted to this purpose."

As this promised figure, with all his other drawings, is lost, commentators have exerted themselves to discover what these scamilli impares really are: not so much, it should seem, on account of the importance and utility of such a discovery, as the desire of out-doing each other, like the Greek mathematicians, striving to double the cube; and all, except Baldus, with no better success. And even Baldus himself, though he hit upon the real device, as to situation and figure, could not trace out the

etymon of the term by which Vitruvius transmits it, nor ascertain the exact symmetry of it's figure. Some think it is derived from scamillum, the diminutive of scamnum, a foot-stool : but if so, Vitruvius is argued to have offended against grammar, and not only that, but against common sense, by loading the dado of a stylobate, not with a foot-stool alone, but with a plurality of foot-stools! Scamilli was undoubtedly a technical name, and all attempts to trace it to an etymon must be nugatory, for if it had any allusion to scamillum, Vitruvius would not have used it in the masculine and plural, as he must have known both the sense and gender of scamillum.

Philander invented three devices to explain the thing intended by this term. One, by thin subplinths, placed on the tops of the stylobates, to elevate the bases of the columns, lest they should appear as if they were sunk in a trench, as the projectures of the corona, in very high stylobates, would prevent the bases, unless thus elevated, from being seen. The second device, was to continue thin swatches, the upper not so wide as the under one, along the dado both of the stylobates, or those parts, in a continued pedestal, which are under the bases of the columns ; and also, without interruption, on the parts which are under the balustrades. The third device, and of which Philander declares himself in favor, was to break the whole profile, inwards, of the parts under the balustrades, which gives an appearance of detached stylobates for all the columns ; and by the recesses between, no doubt, it answers the purpose of obviating the previous trench-like appearance. This device the Patriarch Barbaro adopted : and Perrault, without further study, followed Barbaro's design, and,

as it appears, immediately put it into the engraver's hands, not then suspecting the subsequent embarrassment, this hasty conclusion would occasion, when he should have to explain a passage in the sequel, alluding to the epistyle ; to which when Philander came, he, perceiving a general defeat of all his three devices, passed it over without a word of explanation. Barbaro and Perrault, however, encountered the difficulty, and with what success, will presently be seen.

Baldus evidently involved himself in the same perplexity as Barbaro, by composing his treatise on the *scamilli impares*, before he had maturely studied the disposition and symmetries of epistyles, of which the reader will be convinced from the following discussion ; for, wholly engaged in combating Philander's devices, which he did with success, he took a hint, without reflecting on future opposition, from the continued uninterrupted swathes, in Philander's second device : and by discontinuing them in the parts under the ballustrades, and retaining them on the dados of the stylobates, with a little variation, converted them into regular raised pannels, the under one in breadth equal to the proper breadth of a stylobate, but of such a height as to leave a margin, under the corona, and above the base, of 8, 10 or 12 minutes ; and the upper pannel so adjusted on the under one, as to leave a similar margin, from its four sides, to the four sides of the under pannel.

Now since such raised pannels answer, without a possibility even of cavil, to every requisite in the text of Vitruvius, we may conclude the *scamilli impares* were nothing else. For they are unequal, *impares* ; they are an addition to the middle of the stylobates alone; the masons in working them, or getting them out,

as they say, use not the level, but a tally ; and they completely obviate the trench-like appearance.

But against Philander's three devices, the objections are these ; the first is out of the question, for Vitruvius was evidently speaking of things, appertaining to the dressing and ornamenting the wall, from the ground to the pavement of the platform, and not of any thing upon it.—The second device is inadmissible, since such continued swathes along the middle of the dado, instead of obviating the appearance of a trench, causes an appearance of two, one between the corona and the swathes, another between the swathes and the base. And Baldus refutes the third device, and exposes Barbaro's arguments, in defence of it, with conceits of pleasantry and an air of triumph ; proclaiming how powerfully a little truth, dispels the mist of many errors, and this discovered truth, he maintains, to be the raised pannels, above explained : and his reasoning, to shew the absurdity of breaking the profile of the entire stylobate, by projecting and returning angles, is perfectly convincing : for certainly by such a device, there is no addition made in the middle of the dadoes, but a very unnecessary, unprecedented, and unintended labor and expence, added to the work. Yet strange and incredible as it may appear, this same Baldus, in the sequel of his treatise, baffled by a subsequent document of Vitruvius, which, through his own misconception of the import, he knew not how to explain, consistently with the device of raised pannels on the dado of the stylobate, gave up his device. Therefore Baldus, against Baldus, objects that, after all, he no where recollected to have seen or heard of the raised pannels ; but who had seen inflated columns ? Yet Vitruvius both speaks of the
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entasis, or swell in the middle of columns, and promises a figure to explain it, as he does here for the scamilli impares. The passage in Vitruvius, which so puzzled Baldus, silenced Philander, and induced Perrault to give an explanation replete with absurdities, rather than to say nothing, after the example of Philander; I shall here insert, in the words of the text.

“Capitulis perfectis, denique in summis columnarum scapis, non ad libellam, sed ad æqualem modulum collocatis, uti quæ adjectio in stylobatis facta fuerit, in superioribus membris respondeat symmetria epistyliorum.” In English,

The capitals being finished; lastly, let the symmetry in the upper members of the epistyles, answer to the things placed on the shafts of the columns, not by a level, but by an equalized tally, as the addition was made in the stylobates.

Now the intricacy of this passage is in the words *collocatis*, and *æqualis modulus*, the former was understood by these commentators to belong to *capitulis*, which makes the sequel nonsense; and *æqualis modulus*, they took in the sense of *model*, instead of a little measure or rule, in the sense of our term, *gage* or *tally*; and, the adjunct *æqualis*, which they understood in the sense of *similar*, but which means, in the sense of counter part, an adequation of profile, as when mouldings, or fascias, have their profiles inverted and transferred to the edge of a thin piece of board, so exact, as to touch every part of such mouldings and fascias, when applied. This is called a *gage* or *tally*, used by the working mason, to prove the truth of his work, amongst projectures, as the level is used to prove the even surface. And, in summis columnarum scapis collocatis, is nothing more, than

a circumlocution for, *epistylis*, which is a Greek compound, not expressible by any word, either in latin, French, or English : for, *architrave*, is a barbarous term, and ought to be exploded, and epistyle established in it's place, which, it is true, is purely Greek, but so is arithmetic, geometry, peristyle, prostyle, systyle, eustyle, and innumerable other Greek terms of the arts and sciences; familiarly used, and perfectly understood; and why not epistyle? But it appeared to Philander and other commentators, the expression, on the tops of the shafts, in summis scapis, determined the word, *collocatis*, to belong to *capitulis*; and then, puzzled, as they well might be, to set capitals on the shafts, and not true to the level, but to the *æqualis modulus*, of which they knew not the meaning, gave up the whole passage. Barbaro labored to explain it, and Perrault as usual, pronounced it corrupted.

Certainly capitals are placed on the shafts, and the epistyles apparently are sustained by the capitals, but not in reality: the Greeks and all experienced architects, suffered not the workmen to repose the soffits of the stone, or marble epistyles, on the whole extent of the abacus, by which the edges of the cymatias would be crumbled and broke; but on the middle of the summit of the capitals, the stone was left a small matter higher, than on the extremities, to receive the bedding of the epistyle, and this, being equal to the upper part of the shaft, was called by Vitruvius *summis scapis*.

Thus, I flatter myself, I have rendered this passage intelligible. Which Perrault boldly asserts to be manifestly corrupted: Baldus, however, who was a much better linguist than Perrault, saw no corruption in the text, but mistaking the import, imagined that, whatever was

was before intended by the scamilli impares, as to figure, symmetry and disposition, the same was here ordered to be transferred to the epistyles: and so understood Philander, and passed over the passage: but Baldus, engaged *professedly* to explain the scamilli impares, and perceiving the absurdity of placing raised pannels in the epistyles, over every column, and leaving the parts of the epistyles over the intercolumns, of some other figure and symmetry; having also refuted the equally absurd breaking of the entire profile; was under an *imaginary* necessity of adopting some other device; and unluckily for his reputation, chose the first of Philander's, placing subplinths under the bases of the columns; and, to explain the present second passage, places similar plinths over every capital, and raised the epistyles from their bedding. contrary to all precedent, and to common sense.

To conclude, Baldus was certainly the discoverer of the lost scamilli impares, by the idea of raised pannels, though he determined not their size, that is, their symmetry. And I beg leave to take credit, for having defended Baldus against Baldus, by the explanation of this second passage, which I not only maintain to be the sense of Vitruvius, but also will now prove, it settles the symmetry of the scamilli impares. For the symmetry, subsequently assigned by Vitruvius, for epistyles, is ordered, in this said second passage, to be given to what comes on the columns, like that in the addition made in the stylobates. Now when a tally is cut with the counter part of the three fascias of the epistyle, it should be the same as was used in getting out, as it is called, the pannels on the dado of the stylobate: consequently, as the lower fascia is of any number of minutes
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high, the same number *ought* to have been between the corona and the top of the under pannel: and the minutes in the height of the middle fascia of the epistyle, *ought* to have been the breadth of the margin between the upper and under pannel of the dado; and this margin continued on the four sides, setting off at bottom, the same as at top, and in the very projectures also of the fascias of the epistyles, the pannels, or scamilli impares, will then be compleated in the symmetry of the members above in the epistyles, as Vitruvius has ordered; who only assimilates the symmetries, between the scamilli impares and the epistyles, by the moduli æquales, or, equalised tallies, and not by detached pannels, or, interruptions of the fascias in the epistyles, where their continued line does not cause, as in the dado of the stylobates, any trench-like appearance.

The device, adopted by Perrault, besides the objections made to it by Baldus, by breaking the epistyles, in the manner he does the stylobates, narrows the soffits over the intercolumnns, so much, as to render them unsafe, and of a monstrous appearance; moreover it perverts the rule, which requires them to be equal to the upper diameter of the shaft; and, lastly, requires similar breaks in the freeze and cornice, than which nothing can be conceived more ridiculous and absurd.

SECT. III.

What completes an Exemplar of Grecian architecture.

THE confusion, arising from the unmeaning terms, the *five orders* of architecture, has occasioned, amongst other absurdities, a difference of opinion, as to what constitutes an exemplar of Grecian architecture, or what is

is denominated by the moderns an order. Some take it to be a pedestal, column, and entablature : others exclude the pedestal, but all agree to assume the definition of Vitruvius to explain what they erroneously term an order of architecture ; and complain that his definition is obscure, from the difficulty they experience, when they attempt to wrest it to their own preconceptions. To conform, however, to their idea of the matter, without adopting their error, an exemplar of Grecian or Roman architecture, will be a less exceptionable term, though by no means strictly proper, by which to express what they mean by an intire order.

And here the stylobate is to be considered as an occasional accessory, but not an essential constituent of a complete exemplar. Hence Vitruvius, who so attentively describes the forms and precise symmetries of bases, shafts, capitals, epistyles, zophori or freezes, coronas, cymatia, and simæ, with the pediments and acroteria, in the different styles, assigns no symmetries to the base, dado or trunk, and corona of a stylobate : because he knew, in the first place, stylobates are not always in sight, though, strictly speaking, always in use; for in reality they are the foundations or bases of intire columns : and what we term the column's base, Vitruvius uniformly names spiræ, as will be noticed in Sect. 5, beneath ; secondly, when stylobates are exposed to view, in Temples, their height cannot be ascertained in any symmetrical quantity, or by any of the members of an intire exemplar, but depends on the number and height of the steps in front of the Temple, and this is an unsettled matter, for the number may be any thing between 3 and 103, which the Serapion is said to have had : of course, as the height of the stylobate cannot

have place in the canon of symmetries, the moderns have no authority or precedent from Grecian architecture, to assign appropriate symmetries to it. And the conclusion fairly is, that the stylobate is not a constituent of an intire exemplar of Grecian architecture. But I have already observed an exemplar which I substitute for order, is, after all, foreign to Grecian usage; the subject, which contained columns in their appropriate characters was the *primary*, the columns only the *secondary*, idea; as in Temples, a prostyle, hexastyle, octastyle &c, were epithets used for substantives, which were necessarily understood to make sense of such terms. And when we say a Doric hexastyle, an Ionic octastyle &c, the sense is good, and the terms intelligible and architectural; and it would be equally good sense to say, an hexastyle or, an octastyle ordination. But to say, an order or ordination of architecture, or, the Doric or Ionic order, were to utter terms of no meaning, and sounds without sense. The business of order, or, ordination, is, to settle the number, the size, and distances of columns, walls, porticoes &c; but the character, or, kind of column and entablature, is clearly ascertained by the names Doric, Ionic, Corinthian. And it is equally incongruous to say, the Ionic order, as to predicate, Ionic octastyle, or, Ionic systyle, because Ionic is here predicated of octastyle, instead of columns: but an *Ionic octastyle* means an octastyle Temple with Ionic columns.

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SECT. IV.

Of the kinds and characters of Columns.

THERE are four distinct characters of Grecian columns, though some authors contend, there are but three, the Doric, Ionic and Corinthian; because Vitruvius treats of Tuscan architecture, and of course of the Tuscan column, after he had described the other three styles of Temples. But I shall adduce reasons for concluding that the Tuscan style was not only of Grecian origin, but even practised at Athens long before the Corinthian column was there known.

As to the pretence of a fifth character of column, denominated the composite, Vitruvius recognizes such a kind, in his time, but allows it not to be a distinct column, and says it can be called nothing but a variation of the Corinthian, by assumptions of Ionic volutes, and Doric echinos; retaining the Corinthian symmetries and diversifying the sculpture.

And in fact the Doric column, differs very little from that which Vitruvius assigns to Tuscan Temples, with the exception of the base, which was not originally a part of the Doric column: the symmetry, however, is not the same in both, though in their capitals even that is not much different; the Doric is much less delicate than the Tuscan, at which Perrault, Sir Henry Wotton, and other moderns, express their dissatisfaction, and certainly they would have reason to do so, had Vitruvius taught, what they have practised; viz, assigned Tuscan columns as supporters to the Doric; but such a disposition is foreign from the documents of Vitruvius, and is one of the abuses in modern architecture, as will be seen in the next chapter, on Tuscan Temples.

Temples. The Ionic column, was invented by the same people, who first used the Doric, but who judged the massive appearance of the Doric, too masculine to have place in Temples, dedicated to females, as Diana and others, and therefore sought a more delicate symmetry, and invented a new capital: succeeding generations, says Vitruvius, improved in their taste, affected a still more light and airy style for the Ionic: and lastly the Corinthian column was improved by Callimachus, into a still more slender form; though it is said, the Athenians erected no Temples in this style, previously to the Olympian by Cossutius: and there is great probability, that the symmetry of this column was traditionally received from Solomon's Temple, and with the capital nearly in the figure and symmetry of that, which Hiram designed; before Callimachus took a hint, from the acanthus creeping up the sides of a tile-covered basket, to draw a design for a capital, which was afterwards adopted by other Grecian states, as well as by the Corinthians, for their delicate columns, instead of the lily-formed capital assigned by Hiram to the columns in the Temple of Jerusalem. The more particular description of columns, will necessarily be given when the canon of symmetries is under discussion.

One particular, however, may be more properly introduced in this section: viz, the idea of coupled columns as seen in many modern structures; and also, though more judiciously managed, in the admired cathedral, in our metropolis, erected by Sir Christopher Wren. Sensible as I am, that it will appear presumptuous in the unknown, and hitherto unheard of writer of this tract, to pretend to criticise, and even to decide against, what so celebrated a genius, as Sir Christopher judged

judged to be eligible and regular in architecture : this shall not prevent my entering my protest against the practice, and exposing the defects of that disposition.

In this encounter, I have not only to combat the general opinion, in favor of our idolized architect, but also Perrault supported by the highest architectural authority in our own country. So enamoured of this invention was this French academician, as not only to practice it in preference to every other disposition ; but to recommend it, as he thought, with more authority to posterity, he characterized the invention with Greek names, as pseudosystyle, and pseudodiastyle ; and thus by over fondness has killed the bantling ; for he could not have hit upon more degrading terms, which he improvidently borrowed of Vitruvius's pseudodiptere and pseudoperiptere ; terms, which acknowledge the superiority of a diptere and periptere, for which, the dispositions substituted, are commendable merely for retaining the appearances of what was more perfect, while they consulted convenience, by omitting a part of the reality. But in coupling of columns, in Perrault's project, both the propriety of the appearance, as well as the reality, are wholly destroyed ; and *pseudo*, is certainly a very just epithet for such a contrivance. Systyle is a species of intercolumns of 2 diameters, and diastyle of 3. To translate his pseudosystyle and pseudodiastyle, we must read, falsely 2 diameters &c : and his explanation of his project, is as false as the thing itself ; for he represents a tetrastyle, or facade, with 4 columns, and 2 diameters the intercolumns : he then brings one of the middle columns from it's place, and couples it with the angular column ; this done, instead of moving the other middle one, he keeps it stationary, and

and brings the other angular column to it, and calls this new arrangement, pseudosystyle ; which is, in the first place, manifest chicanery ; for the then new front line, with the same 4 columns disposed on it, at equal distances, the intercolumns would be pycnostyle not systyle : secondly, this new disposition, which, in his own idea, ought to be named pseudopycnostyle, produces $3\frac{1}{4}$ diameters for the central intercolumn ; and Vitruvius says, even 3 diameters is a dangerous bearing for the epistyle : his project, therefore, is inadmissible in point of sound building, and is wholly subversive of eurythmy, decorum, and the true rules of symmetry taught by Vitruvius, and exemplified in all the most beautiful paragons of Grecian magnificence.

In the manner, however, Sir Christopher Wren has contrived to couple the columns in the portico of St. Paul's, there is not any of that whimsical trifling discerned, which Perrault so busily indulged in. The whole front line of 110 feet is judiciously divided, so, as to produce the most beautiful of all the five species of intercolumns, called by the Greeks the eustyle, which requires exactly two diameters and a quarter for every intercolumn except the central one, which is to be just three. The coupled columns are considered as integrals, and the ordination so contrived as to answer that perfect symmetry in the intercolumns, which is the cause, in reality, of the pleasing effect, the aspect of the portico produces, and not because the columns are coupled. And I am very confident, had the columns been single and duly disposed in the eustyle, the effect would have been still more pleasing. I will venture also to say, Sir Christopher was of that opinion too ; and the reason he adopted these pairs of columns was for strength ; for
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and he made choice of a decastyle in eustyle, for the under portico, the columns must have been considerably larger, and of course, higher, which was incompatible with the present design of one portico over the other, besides the difficulty of procuring stones of a sufficient size. Therefore, having the authority of modern precedents for coupling columns, he had recourse to that expedient.

But the defects, in this invention, are, that the beautiful Corinthian capitals, by this close approximation, have each, one of their four sides so imperfectly seen, even in front of each pair, as to occasion a desideratum; and when viewed obliquely, the profile of one capital, shuts, in a manner, against the middle of the ornaments of the other, and causes a very unpleasant confusion. Another defect, is, when the whole front is viewed on an angle, the small spaces between one column and the other, in the pairs, is lost to the sight, and the two shafts appearing as one mass of stone, have a very disgusting effect. And these arguments, together with what I have urged above against Perrault, I humbly conceive, must to an unprejudiced architect, appear conclusive in proving, that coupled columns are not to be adopted for their beauty of disposition.

The ancients, say the moderns, never practised the coupling of columns, because they never thought of it, but this is a mistake; for in the Temple of Bacchus at Rome, there are such pairs of columns, evidently so disposed, in order to procure a sufficient strength to support a massive and ponderous load of masonry, with which they are surcharged,

SECT. V.

Of Bases of Columns.

IN strict propriety, and according to the mind and documents of Vitruvius, the part of the intire column, which stands on the plinth, and immediately under the cincture of the apophyge of the shaft, denominated by Vitruvius *spiræ*, is all that ought to be considered what we call the *base*; for the square plinth, on which it reposes, and, as it is to be imagined, settles in those cable-like rounds and hollows, as if occasioned by the incumbent pressure of the shaft, is supposed to be the foundation of the said *spiræ*. And there would be more propriety in calling the plinth alone the base, because it is the *basis* of the *spiræ*, than in our calling the compound of the *spiræ* and plinth the base; for the Doric column has neither *spiræ* nor plinth, under it's shaft, yet it is said to stand on it's base. The Greek word *basis*, from which both the latins have the term *basis* also, and we, *base*, signifies the plane or end of a fulchrum at right angles with it's central line, when erect, and not any exuberance about it's periphery; as the base of the human foot is the sole. Therefore, though the inflexibility of custom, frequently, as here, at variance with propriety, seems to preclude the very hope of our dropping the term, *base*, to adopt *spiræ*; yet an attention to the above discrimination, will be found serviceable in deciding the meaning of Vitruvius, in the controverted documents on this part of the intire column.

The Ionic Base, then, seems to have been in general use amongst the Greeks, although so intirely laid aside in later ages; not indeed as represented by modern designs of it, but as Vitruvius describes it. The
constituent

constituent members of it, are, a large torus at top, immediately under the cincture of the apophyge; the supercilium, then a scotia, next two astragals with their fillets, another scotia with a small fillet, all supported by a plinth. But before the respective symmetries can be all assigned to the members of this column's base, it is necessary to premise his description and appropriate symmetries of what he denominates the Atticurgic, or, Attic base. The tuscan base will more properly be discussed in the tenth section: and to the Doric, neither the ancient Greeks, nor Vitruvius, assign any base, in the sense of spiræ; and what is called the Corinthian, is a modern invention, and the sooner it were exploded the better.

The attic base is composed of a small torus under the cincture of the apophyge, a scotia with it's fillets, another larger torus on the plinth. This base is in high repute for it's beauty and simplicity, and is properly assigned to either Corinthian or Ionic columns: and even the Doric column, when executed in it's more delicate symmetry, within walled enclosures, as treated of in next section, may, to gain more height, assume this base, though in it's robust capacity the ancients allowed it not any. It's symmetries by Vitruvius, are these, the plinth in a square form, causing the four corners to sally forth much beyond the circumference of the torus, which projection the Greeks call ecphorati, each side equal to $1\frac{1}{2}$ diameter, of course the projecture of the plinth, from the central line of the column, is 45 minutes. The entire height of the base is half the diameter of the column, equal to 30 minutes: this to be divided into three parts, one of which, equal to 10 minutes, is for the height of the plinth; the remaining parts, into

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four, one of which, equal to five minutes, for the height of the upper torus : the other three equally divided between the scotia with it's fillet, and the lower torus ; to each $7\frac{1}{2}$ minutes. This is all clearly gathered from Vitruvius, who, however, gives not the projecture of the upper torus, deeming it unnecessary, since the cincture of the apophyge determines the centre on which to scribe the semicircular profile of this torus ; and the cincture itself, he has left to discretion, both as to height and projecture, though Perrault insinuates that he has assigned the height, which is not true. The apophyge is that small curve, or sweep, turning from the cincture to the under part of the shaft, in imitation of the bodies of trees taking their upright growth from their root : certainly, then, the less perceptible the square cincture is, at the commencement of the bending sweep, the more perfectly is nature copied ; for we see no such abrupt interruption, in the bending alluded to, in trees : I think one minute even more than sufficient ; and it is but four tenths more than a minute in the bases of the Olympian at Athens. Perrault asserts, in his treatise on the five kinds of columns, that Vitruvius has not assigned any projectures to the Ionic base, which is a gross mistake, and must have proceeded from a slip of memory ; had he said, he settled not the projecture of the upper torus of this attic base, he had been correct ; since Vitruvius determined not the projecture of the cincture of the apophyge, on which that of the upper torus depends : and the projecture of the cincture again depends on the quarter circle of the apophyge, which in some instances has it's radius as much as 5 minutes, in others not more than 2 minutes ; and I would recommend to the practitioner, in drawing this or the Ionic base

base, to regulate the size of the apophyge by the greater or less projecture of the plinth : Vitruvius, indeed, has settled this at 45 minutes, in which case I think the radius of the apophyge may be about 4 minutes : but Barbaro and Perrault judged 45 minutes too much, and all that can be said, is, Vitruvius thought otherwise than these moderns, in a matter that seems rather dependant on fancy and taste, than on any known reason ; and their error is, not the contracting of the plinth of Vitruvius to 41 or 42 minutes, but the not equally diminishing of the projectures of all the members above the plinth ; for want of this, the profile and aspect of the bases designed by Vitruvius, are changed and marred. Hence is seen the reason of what I have just stated ; for supposing the radius of the quarter circle of the apophyge, to be 5 minutes, and the projecture of the plinth 45, as by Vitruvius, the cincture under the apophyge, will then project 35 minutes, and the upper torus, being a half circle from this fillet, and being 5 minutes high, of course will project $37\frac{1}{2}$; and the under torus, being always in the same projecture as the plinth, it conclusively follows, that to preserve the profile, the same reduction of projectures must be made in the upper torus, as in the plinth with it's under torus ; if this is 42 instead of 45, the upper torus must be $34\frac{1}{2}$, instead of $37\frac{1}{2}$; and of course the radius of the apophyge can be, then, only 3 minutes, and the projecture of the cincture, 32.

On the subject of these bases in particular, I could wish to put all our practioners on their guard against Perrault, whose high repute in architecture has induced a too general persuasion of his competency to explain Vitruvius : he has frequently committed himself in the course of his comments, and here very conspicuously, as will presently be

be seen; for first, he has injudiciously established for the height of the cincture of the apophyge, 3 minutes, and 4 minutes for the radius of the curve: which produces an intolerably heavy and unnatural appearance, especially in the attic base, where it comes on a torus only 5 minutes high: and, in both this and the Ionic base, with his idea of the projectures of their plinths, is subversive of all eurythmy in the consequent symmetries.

But to proceed, the symmetries in the Ionic base given by Vitruvius, are, "the extent of the torus every way, (*quoquoversus*,) shall be 1 diameter with the addition of $\frac{1}{4}$ and $\frac{1}{8}$," equal to $82\frac{1}{2}$ minutes, it's projecture, therefore, from the central line 41 minutes and $\frac{1}{2}$: "The height of the base, the same as the attic, and it's plinth also the same; the part above the plinth which is $\frac{2}{3}$ of a diameter, is to be divided into seven parts, three of these to the torus at the top, two such parts to the scotia above with it's astragals and cincture, the other two parts to the lower scotia, but the lower one will appear the largest, because it shall project to the extremity of the plinth." The Reader is desired to notice these last words. "The thickness of the astragals shall be $\frac{1}{3}$ part of the height of the scotia: and the projecture of the torus shall be $\frac{1}{4}$ and $\frac{1}{8}$ of a diameter." This projecture is from the naked of the shaft; before he gives the whole extent of this torus at a diameter and $\frac{1}{4}$ and $\frac{1}{8}$; and this, no doubt, is done to preclude all danger of mistaking the projecture of this member, for the projecture of the plinth, which he previously settled, by saying the plinth the same as the attic. Yet sedulously careful as he was to ensure perspicuity, Perrault has contrived to misunderstand him, and assumes the previous expression of the extent of the torus, for the extent

tent of the plinth, and explains the subsequent expression of $\frac{1}{2}$ and $\frac{1}{4}$, as a confirmation of the former, and both as belonging to the plinth! But how either Barbaro or Perrault could understand the text in that sense, is truly surprizing. For, to supersede other arguments against such an opinion, as the expression, *spira quaquaversus*, and, *ita et ejus plinthus*, evidently assimilating this plinth to the plinth in the attic base; the words, "the under scotia will appear the largest, because it shall project to the *extremity* of the plinth," incontrovertibly prove, that the plinth must project more than the torus at top, otherwise the under scotia projecting to it's extremity, would neither be, nor appear, any larger, than the upper one: for the supercilium of the upper scotia was intended by Vitruvius, after the example of the bases in the Olympian at Athens, to project equal with the projecture of the great torus; of which the semicircular profile, in it's under termination, stands on the supercilium of the superior scotia, in the manner the under torus in the attic base, stands on the plinth. Hence it is evident, if the plinth in this Ionic base projects no more than the fillet of the supercilium, the two scotiæ must be of equal projecture and of equal size.

But the truth seems to be, Perrault was aware of this, and therefore, in the design he gave of this base, in his XIX plate, contracts the torus, and gives it not the $41\frac{1}{4}$ minutes, as the text so expressly orders, but only about 38 minutes projecture. Yet in his treatise on the five kinds of columns, published after his comments, he projects the torus 40 minutes, and the plinth 42; and makes the two scotiæ nearly of the same size.

Now, after taking these capricious liberties with the

text, in the base, in his plate xix, the profile intended by Vitruvius, is not correct; such contraction of all the members gives an appearance of weakness to the base, and in the design exhibited in the treatise alluded to, the torus and plinth appear so nearly of the same projecture as to produce a miserable effect; every thing under the great torus at top, appearing diminutive and trifling.

And it is not merely this error of attributing Vitruvius's words, "*spiræ quoquoversus*," to the plinth; but the additional error of not attending to the import of the term *supercilium*, has, more than any other mistake, contributed to ruin the aspect of this base. In the bases, in the Olympian Temple at Athens, the fillet under the superior torus, which Perrault and all the moderns project about equal with the fillet of the apophyge, is there projected equal to the projecture of the torus over it, as already observed; and this fillet or cincture, supported at it's extreme projection by the upper part of the scotia, to which it belongs, is, from it's appearance, called by Vitruvius *supercilium*, and in no other situation does he give this small square such a denomination, but either *quadra*, *lysis*, or *annulet*; and this sufficiently shews a peculiarity when it is termed *supercilium*, which properly signifies eye brow.—By a due attention to this circumstance, wholly unnoticed by the moderns, the aspect of the base will have the appearance, so much wanted in the modern designs, of a very sufficient solidity to support it's incumbents; and also by taking both the small astragals out of the height assigned to the upper scotia, as Vitruvius clearly orders, and not by dividing between the astragals as all the moderns have; then will this Ionic base, with the plinth projecting 45 minutes, be duly formed to the mind of Vitruvius.

In

In concluding this discussion, for the convenience of the practitioner, I shall subjoin Vitruvius's divisions reduced into minutes, that the several symmetries of heights and projectures, may be seen and compared.

The height of the great torus, $8\frac{1}{2}$ minutes: the upper scotia with it's astragals and supercilium, $5\frac{1}{2}$ minutes: the height of the astragals, about $\frac{1}{2}$ a minute each: the height of the under scotia, $5\frac{1}{2}$ minutes: the height of the plinth, 10 minutes. But it must be observed, that, 1 minute for the supercilium, and 1 for the two astragals, deducted from the height of the upper scotia, the curve of it will be only $3\frac{1}{2}$ minutes high. Projectures, of the great torus at top, $41\frac{1}{2}$ minutes: the fillet, called supercilium, projects equal with the torus: the two astragals also the same: the plinth, 45 minutes. I have before observed that when the plinth projects to this extent, the apophyge should, or, at least may, be considerably larger, than it can be when the plinth projects less. And as the centre, on which is scribed the semicircle of this great torus, is about 37 minutes from the central line, I conceive, the radius of the quarter circle of the apophyge should be about 6 minutes, then will the fillet, 1 minute high, project 36 minutes: and the curve of the upper scotia should be drawn so far inwards, as to have between it's convex extremity and the central line, the distance of 37 minutes: and the under scotia the same. Thus will be completed a strong and sightly base. And by thus projecting the supercilium, as seen in the bases designed by Cossutius for the Olympian, imitated, no doubt, by Vitruvius, the whole profile may be drawn nearer to the central line, by those, who dislike the projecture of 45 minutes in the plinth, without incurring any of those absurdities,

to which the erroneous modern designs of this base are exposed. And the same is to be observed as to the attic base.



SECT. VI.

Of the symmetrical height of shafts.

NOTHING is better understood, nor more invariably observed in practice, than the symmetrical intire height of bases of columns : at the same time, nothing, in Vitruvius, is less comprehended than the symmetrical heights of shafts of columns, the Tuscan excepted ; I say the shafts, because the heights of bases and capitals not being liable to variation, the shafts are the proper subject of the following disquisition.

The symmetrical heights of the shafts of Grecian columns depend on circumstances; as, the various kinds of intercolumns and difference of situation ; when exposed to the full glare of light, or removed into places where only a modified degree of light can encompass them : and, for distinction sake, the former shall be denominated external columns, the latter internal. The symmetrical altitude, however, is to be conceived, in the first instance, as applicable to external columns, and that, subject to a variation, according to Vitruvius, from the species of intercolumns, of which there are five. The areostyle understood to mean more than 3 diameters between the under parts of the shafts of columns. The diastyle, nearly 3 diameters, but not to exceed 3. The systyle, not to exceed 2 diameters. The pycnostyle not more than $1\frac{1}{2}$ diameter. And the eustyle settled by Hermogenes, the inventor of it, as exactly,

exactly, $2\frac{1}{2}$ diameters for all the intercolumns, except that in the centre of the front and postern, to which he assigned just 3 diameters. This species may be considered a reform of the Diastyle.

“ When columns, says Vitruvius, are disposed in the areostyle species, they are to be 8 diameters high; in diastyle, $8\frac{1}{2}$; in systyle, $9\frac{1}{2}$; in Pycnostyle, 10 diameters: and in eustyle $8\frac{1}{2}$, the same as in diastyle.” Hence, it seems, Vitruvius thought the eustyle an improvement only of the diastyle; and in reality the diastyle may be considered as a genus including several species; since here $2\frac{1}{2}$ diameters, and in the Doric ditriglyphon $2\frac{1}{2}$ diameters are as invariably settled for the intercolumn, as the $2\frac{1}{2}$ in the eustyle, yet Vitruvius calls it diastyle. And the same reasoning obtains in the systyle, which as a genus, must not exceed 2 diameters, but any thing between $1\frac{1}{2}$ diameter and 2 diameters can be no other than systyle: and any space within $1\frac{1}{2}$ diameter must be admitted under the genus pycnostyle: for in the works of the ancients, both of Greeks and Romans there are endless variations of intercolumns; and nothing amongst them fixed and certain but the eustyle and the two species of Doric intercolumns, to which might be added the areostyle, in just 4 diameters, with three triglyphs over every intercolumn, but it is inadmissible in stone epistyles. But of this more at large in it's place.

To return: the reason, which Vitruvius assigns for these variations in the symmetrical heights of columns, or in the greater or less degree of delicacy of the shafts, is, that the nearer columns approach each other, the thicker their shafts will appear; which apparent increase of size, he maintains the contraction of the diameter

will correct ; and experience certainly evinces the truth of his assertion : though Perrault combats the principle, and attempts to prove the optical effect of approximation, would be the reverse, as the increased shade would, when columns are very close together, cause them to appear less in diameter : but this is little better than chicanery ; for, though columns of a sable hue will, doubtless, appear smaller than columns of white or very light coloured marble ; the question is, in Vitruvius's reasoning, not about the hue of the columns, but of the reduction or lessening of the glare of the ambient light, the degrees of which are diminished in proportion, as the intervals are contracted : but no change is caused in the colour of the columns themselves. And daily experience evinces, that objects, with which we are familiar only as standing in the open air, suppose statues or vases, on a lawn, when brought into a hall, or a saloon, will appear very considerably larger, than we before judged them to be. This principle of optical effects, therefore, is sound and true ; and not of the fallacious nature of our master's other notions of optics, which induced him to order the changes of attitude, from erect to overhanging, in order to appear perpendicular ; and columns, 50 feet high, to be contracted in their top diameter only 5 minutes, from the notion that the great height will induce a persuasion of the contraction being 10 minutes as in columns of about 15 feet high. Perrault has successfully combated these erroneous conclusions in the 8 chap. 2 part of his treatise on the five kinds of columns, made English by Mr. James of Greenwich, in the year 1708. And, though many ingenious artists have imbibed something of these ancient dregs of false optics, yet it appears not that the ancients themselves practised such

such unnatural attitudes in their statues, or any such fallacious changes of symmetries, to consult optical effects. The columns of the Parthenon, which Mr. Stuart makes nearly 40 feet high, have the upper diameter 47 minutes, which is a greater contraction, than Vitruvius allows for columns of 15 feet high; and by his rule of optics, the top diameter would be 52 minutes instead of 47. A good rule would be to contract the diameter at the upper part of shafts, to 50 minutes in all heights whatever, and our eyes will assuredly perceive the propriety of it.

But I now come to the consideration of increasing the delicacy of shafts of internal columns, and that too, more or less, in proportion as they are further removed from the full influence of the external light, Hence Vitruvius judiciously attended to their internal situations in settling the ratio of the degree of slenderness they are to have, when standing just within external columns, as in the pronaos of a Temple; and when standing at nearly twice that distance from external columns, as in the middle of the ancient Stoa, wherein the Stoic philosophers walked when they delivered their precepts; or in porticoes behind theatres; in which the row of columns along the middle, was distant from the external columns, and from the wall, the length of a column. The rule for reducing the shaft, in the pronaos of a Temple, is, if the external columns are 8 diameters high, the internal shall be reduced till their diameter will repeat 9 times in the same absolute height. If the external are 9 diameters high, the internal shall be reduced in the same ratio, viz, as 8 was to 9, so 9 will be to 10 diameters and $7\frac{1}{2}$ minutes: again if the external are 10 diameters, the ratio will be for the internal, as 9 diame-
ters

ters was to 10 diameters, $7\frac{1}{2}$ minutes, so will 10 diameters, $7\frac{1}{2}$ minutes, be to 11 diameters, $2\frac{1}{2}$ minutes. These external and internal columns, it must be observed, are in symmetries appropriate to Temples, and only for Ionic and Corinthian columns, whereof the external ones are supposed to vary according to the previous rules of intercolumns.

But, says Vitruvius, Book 5, Chap. 9, columns in stoai and double porticoes, require external columns to be more airy and slender, than such are, as belong to Temples, where gravity is expected rather than delicacy,

It is here to be observed, Vitruvius included not Doric columns, when, in his 3 book, he regulated the increase of the symmetrical height of columns by the rates of their intercolumns: because he had not, *then*, discussed the subject of Doric architecture, which he reserved for his 4 book, and there treated of it, as employed in Temples, settling the height of the external columns at 7 diameters. Therefore, when, in his 5 book, he describes the spacious porticoes behind Temples, he properly begins with those which are disposed and ordained in Doric architecture, and with an eye to his subsequent document, which I have anticipated above, says, "the porticoes should be double, *let* the external Doric columns with their appropriate ornaments be perfected in their symmetry, and the breadth of the portico must be, in each walk, equal to the height of the external columns"; that is, between the under part of the external columns, and the under part of the middle row of columns, there is to be the distance of a column's height, which here is $7\frac{1}{2}$ diameters, and the same distance from the middle row to the wall; but the columns in the middle row are to be *part higher*
er

er than the external columns." Now a fifth part of $7\frac{1}{2}$ diameters is $1\frac{1}{2}$, therefore the symmetrical height of the internal columns in the middle row, is to be 9 diameters, when the portico is in the Doric style. But, says Vitruvius, these porticoes and double walks "may be designed, deformetur, either in Ionic or Corinthian manner, genere." Then follows, what I have above anticipated of the propriety of increasing the delicacy of shafts of external columns, when not employed in Temples: "if Ionic, continues Vitruvius, the shafts without the base and capital, shall be $8\frac{1}{2}$ diameters." Here it is to be observed, that though the real height of the Ionic capital is well ascertained, in theory, to be $\frac{1}{3}$ of a diameter; yet, in practice, the carver assumes a detached piece of marble of rather more than half a diameter high, on account of the volutes which descend something more than $\frac{1}{2}$ diameter: Vitruvius, therefore, judiciously abstracted from capital, and from base also, wherein the piece of the shaft is connected to form the sweep called apophyge: the external Ionic column, therefore, may fairly be settled at $9\frac{1}{2}$ diameters, according to the mind of Vitruvius, who thus continues, "if Corinthian columns, the shaft and base as in the Ionic," the base from the bottom of the plinth to the top of the spiræ, is always half a diameter, but from the block of which the base is formed, the cincture and apophyge with a small portion of the under part of the shaft to contain the circular finishing of the fluting, are always got out: now the least that can be left for this is 10 minutes, the capital by Vitruvius 1 diameter, by the moderns $1\frac{1}{2}$: so that the external Corinthian column, by Vitruvius, is to be in it's symmetrical height, 10 diameters and 10 minutes; by the moderns 10 minutes more.

For

For the height of the internal Ionic column, in the middle row of double porticoes, or in other situations equally remote from the glare of light, a fifth part of the symmetrical height of the external column of $9\frac{1}{2}$ diameters, is to be added, and a fifth is 1 diameter and 54 minutes; the internal column, then, is to have it's shaft reduced till it's diameter will repeat 11 times and 24 minutes in the given absolute height of the external columns,

For the Corinthian internal column, a fifth part of the external of 10 diameters and 10 minutes, is 2 diameters and 2 minutes; it's shaft, therefore, is to be reduced, till it's diameter will repeat 12 times and 12 minutes : and if it has the modern capital, 12 times and 24 minutes, in the given absolute height of the external columns.

This exposition and explanation of the passage in the 9 chap, 5 book of Vitruvius, I maintain to be the true meaning of his documents, which are the most interesting and important of any in his whole diffusion of symmetries : which have been wholly overlooked by most commentators, and most miserably misconceived by Perrault, who took the sense of the passage to be, that either Ionic or Corinthian columns were to compose the middle row, though the outward row were Doric; and that the columns, in the middle row, were to be a fifth part higher than the external columns, in *absolute* and not in *commensurate* or *symmetrical* height ; in the sense, that if the external were 15 feet high, the internal were to be 18 feet in height, and he thus exhibits the design of this portico, and observes in his note, such a disposition and plan have a very strange appearance ; but it is his own plan, not that of Vitruvius, that is so truly strange, ridiculous and absurd.

Many

Many are the abuses of Grecian architecture, in use amongst the moderns; but their inattention to this most reasonable document of Vitruvius, of lengthening the shafts of internal columns, has proved more destructive than, perhaps, any other, to the reputation of that style; and tended proportionally, to countenance the efforts of those, who, willing to sink again into the barbarous darkness of a few centuries back, are busily employed in reviving, and publishing even the most pitiful remains of village Gothic Churches; and every mouldering morsel of the art-spurning ages; to recommend them, to the rising generation, as specimens of ancient British architecture! Yet, I hope, there is sufficient taste and true genius amongst the professors of the arts and sciences, to guard the deposit of true architecture, which, when rescued from the mischief threatened by long standing abuses, will always transcendently surpass the very best paragons of the Norman and Gothic style.

As to fluting of the shafts, which, in Grecian columns, should never be omitted, both the theory and practice is so well understood as to render the insertion of Vitruvius's directions unnecessary. The entasis also, or swelling in the middle of columns, has been much insisted on by some, and slighted by others. There can be no doubt, but some of the ancients thus inflated their columns, since Vitruvius not only mentions it, but promised a design to explain the method of performing the swell gracefully: the truth is, it may have been practised without being perceived; for Vitruvius teaches that angular columns are to be $\frac{1}{8}$ part of the diameter more massy than the others, and this being only 1 minute and $\frac{1}{2}$, may easily be overlooked; and very probably

the entasis also might have been so minute, as to escape notice : the loss, however, of the method is little to be regretted, since columns are very beautiful without any such swell.

Vitruvius has left us, also, a strange precept respecting the shafts of columns; which is, that the angular column, and all others, on the sides of Temples, ranging with it, shall have the whole contraction of the top of the shaft, on the outside, and the side to the wing perpendicular. Whether this was ever practised, I cannot take upon me to decide: but so little were some of the largest columns contracted at top, as to render such a disposition scarcely perceptible : otherwise one need not hesitate to pronounce such a precept extravagant. The end, perhaps, intended, by such a posture, was, to resist the centrifugal pressure, as it were, of the principal rafters of the roof, resting on the epistyles : for the other suggestion of conformity, between the inside of the columns and the side wall, would equally demand a like posture opposite the antæ in the front columns ; which, however, he expressly orders to stand with their central line perpendicular.

SECT. VII.

Of the symmetries of Capitals,

THE characters and denominations of columns, according to Vitruvius, are distinguished solely by the capital. And though the moderns, from the authority of the Roman antique, attribute to entablatures characteristics, nearly as distinct as capitals, it does not appear that the ancient Greeks acknowledged any such proprieties; for Vitruvius, 1 chap. 4 book says, "the things placed on
Corinthian

Corinthian columns are either in Doric symmetries, or the Ionic, because the Corinthian style has no appropriate cornice nor other ornaments of it's own, but borrows mutiles, for the soffit of it's corona, as disposed over triglyphs in the Doric, the freeze with sculpture like the Ionic with denticules in the cornice, and takes the Doric guttæ in it's epistyle, and these, together with it's proper capital, make a third kind of work. Hence, from the formations of the 3 sorts of capitals, arise the denominations of Doric, Ionic, Corinthian, of which the first and most ancient is the Doric."

The Doric was invented by the subjects of Dorus, but their Temples in that style were without elegance, as the nature and perfection of symmetry was intirely unknown to them. But when these people became the subjects of Ion, they conceived a commensurate and well regulated plan, would be much préférable to the vague and capricious rudeness of their former Temples; but for want of an established rule, they made experiment, how often a foot was contained in the height of the human stature, and finding it six times, concluded the column should have six times it's base in it's height. And here, it should be observed, Vitruvius in this relation uses the term, *basis*, not *spira* which he invariably uses for all columns, except this Doric, to which the ancients never assigned a base, in our acceptation of the term: and *basis* only means base in the sense we use the sole of the foot, as I have observed above in Sect. 5. To return; these subjects of Ion, first reformed their Doric column, which, probably, before had but 3 or 4 diameters in it's height, by settling 6 diameters for the height, and by this masculine symmetry they added something of elegance to strength.

Perrault conceived, that Vitruvius said the intire Doric entablature was placed on Corinthian columns ; my reader must be convinced from the above passage, faithfully translated, how superficially he read Vitruvius.

To come, then, to the particular symmetries of capitals ; and first of the Doric, (as the Tuscan will be treated of in the tenth Sect.) the height Vitruvius makes $\frac{1}{2}$ a diameter, and divides it into 3 parts, whereof he gives 1 to the height of the plinth with it's cymatium ; and here let it be remarked, that this is the member called, at other times, the abacus ; and the particular height of it's cymatium is left to discretion : another, of the 3 parts, he assigns to the echinos with it's annulets ; and the last, to the neck of the capital.

Vitruvius took for the Corinthian and Ionic, a diameter of the column for his module ; but for the Doric only $\frac{1}{2}$ a diameter, being more convenient, as it measures, without division of it, the height of the capital, and the breadth of the triglyph ; and $1\frac{1}{2}$ module is the height and width of a metope. By this module he ascertains the projecture of the capital, saying, the breadth of the capital shall be of 2 modules and the $\frac{2}{3}$ part of a module, = 65 minutes : of course, the projecture of the plinth or abacus, which I maintain to be the subject of that breadth, is $32\frac{1}{2}$ minutes.

This projecture, which appears to me most explicitly and clearly ascertained, has given rise to much controversy amongst the learned : Barbaro, Alberti and Perrault conceived the breadth was to be taken at the *cymatium* of the abacus ; and Alberti designed the Doric capital accordingly ; and the extremely disagreeable effect of his design, is fully sufficient to convince all, who

who are the least acquainted with Grecian architecture, that Vitruvius could not intend his symmetry to produce such a disfigured capital : Barbaro was of opinion some addition should be made : but Perrault goes further, and, as usual with him, argues the text to be corrupted, and that it should be read, $2\frac{1}{2}$ modules, instead of 2 and $\frac{1}{2}$. Now these learned commentators ought to have reflected, that the reputation of this capital depends, not on the sally of the cymatium of the abacus ; which Vitruvius neither has, nor intended to notice, as he did not give it's height ; but, solely, on the projecture of the abacus, here called the plinth, which he has most clearly ascertained by the whole extent being $2\frac{1}{2}$ modules. And the reason he said nothing of the height or sally of the cymatium, was, because first, it is a dependant and variable member ; and secondly, he knew it was sometimes omitted, as in the Doric capitals of the celebrated Parthenon at Athens. Moreover, this is the only projecture given throughout the capital ; for the neck, or hypotrachelion, is governed by the top of the shaft ; and the annulets he left to discretion : and strange indeed would it be, not to say absurd, to give the only solitary projecture, to a vague small member ; and leave the principal member, on which the propriety of the whole capital depends, undetermined and subject to it's mere accessory, as every cymatium is to be considered ; and which, Vitruvius never orders to be more than a sixth part of the height of the member it crowns ; as in denticules, coronas, and, consequently, the same when it caps the abacus ; and cannot be more than 2 minutes high, and it's sally, from the abacus, 2 minutes also ; Barbaro gives it 4 minutes height ; Alberti 8 ; Serlio 3 ; Palladio $4\frac{1}{2}$: and Perrault, erroneously taking the extent

extent at the cymatium, and according to his own perverse correction of the text, projects the cymatium $37\frac{1}{2}$ minutes : see his note 8, on 3 chap. 4 book. And in his explanatory design, *ibid*, assigns no projecture to the abacus itself ; for having usurped the only projecture, Vitruvius gave, which he extravagantly changed from $32\frac{1}{2}$ to $37\frac{1}{2}$, for the projecture of the cymatium ; of course he could not find, in the text, any projecture for the abacus, and has actually left it without any in his design. And here is one, amongst many instances, which verify the charge I brought against Perrault, that he sinned rather to bend down the Doctrine of Vitruvius to a conformity with the Roman antique, than either to give the genuine documents of his writings, or to correct the excesses and abuses, found in those remains, by his true Grecian symmetries.

The annulets under the echines, or ovola, in this capital, are usually executed, as they are seen in the Doric of the Theatre of Marcellus at Rome : but those plain squares, projecting one over the other, like three flat rings, are, though admissible enough on very small scales, far inferior to the form they have in the capitals of the Parthenon ; wherein each annulet has it's profile like the angle of a square ; the under side longer than the upper, and a little hollowed ; Mr. Stuart has accurately delineated them, and they have a very good effect.

The Ionic capital, has symmetries and a disposition altogether peculiar to itself ; and the verbal description of them by Vitruvius, when duly attended to, is by no means either obscure or inexplicable, as Perrault pretended ; who, according to custom, has changed the reading of the text, on this occasion, so frequently

quently, and withal so barbarously, as to leave no part of Vitruvius's expressions and meaning intire. It must be acknowledged, there are some parts of the description rather intricate, and, without the explanatory design, require a patient application of mind, to discover the true sense. But I hope to satisfy my readers, that in the text, every requisite is unequivocally expressed, and the arguments to be deduced, from what is so expressed, shall be perspicuous and conclusive: and thus I hope to demonstrate the entire figure of this capital, and the several symmetries of it's parts. And, since this capital is very beautiful, and a very considerable object in 'architecture; and the controversy on it's appropriate symmetries by no means interesting to the amateurs in this art; I here, for their accommodation, who have not the latin text at hand, transcribe it verbatim.

“Scapis columnarum statutis, capitulorum ratio et pulvinata erunt, his symmetriis conformabuntur, uti quam crassus imus scapus fuerit addita octavadesima parte scapi, abacus habeat longitudinem et latitudinem, crassitudinem cum volutis ejus dimidiam: Recedendum autem est ab extremo abaco in interiorem partem frontibus volutarum parte duodevigesima et ejus dimidia: et secundum abacum in quatuor partibus volutarum secundum extremi abaci quadram lineæ demittendæ, quæ catheti dicuntur. Tunc crassitudo dividenda est in partes novem et dimidiam, ex novem partibus et demidia, una pars et dimidia abaci crassitudini relinquatur, et ex reliquis octo volutæ constituentur. Tunc ab lineæ quæ secundum abaci extremam partem demissa erit, in interiorem partem alia recedat unius et dimidiatæ partis latitudine. Deinde ex lineæ dividantur ita,
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ut quatuor partes et dimidia sub abaco relinquuntur. Tunc in eo loco qui locus dividit quatuor et dimidiam et tres et dimidiam partem, centrum oculi signetur, ducaturque ex eo centro rotunda circinatio tam magna in diametro, quam una pars ex octo partibus est, ea erit oculi magnitudine, et in ea catheto respondens diameter agatur. Tunc ab summo sub abaco inceptum in singulis tetrantorum actionibus dimidiatum oculi spatium minuat, donec in eundem tetrantem, qui est sub abaco, veniat. Capituli autem crassitudo sic est facienda, ut ex novem partibus et dimidia tres partes præpendeant infra astragalum summi scapi. Cymatio, adempto abaco et cannali, reliqua sit pars. Projectura autem cymatii habeat extra abaci quadram oculi magnitudinem. Pulvinorum balthei ab abaco hanc habeant projecturam, uti circini centrum unum cum sit positum in capituli tetrante, et alterum diducatur ad extremum cymatium, circumactum baltheorum extremas partes tangat. Axes volutarum ne crassiores sint, quam oculi magnitudo, volutæque ipsæ sic cædantur, uti altitudinis habeant latitudinis suæ duodecimam partem."

The translation, "The shafts being erected, if the pillow kind of capitals be adopted, their symmetries shall be these; the abacus, in length and breadth, shall be $1\frac{1}{2}$ diameter: the height, including the volutes, $\frac{1}{2}$ that dimension," equal to $31\frac{1}{2}$ minutes; "And from the extremity of the abacus towards the faces of the volutes, there is to be the distance of an $18\frac{1}{2}$ part:" equal to just 5 minutes: "And in the four parts of the volutes under the abacus, at the orlo or fillet of the abacus, lines called catheti are to be let down. Then the whole height is to be divided into $9\frac{1}{2}$," each such part equal to $3\frac{1}{2}$ minutes, "of these $1\frac{1}{2}$ " equal 5 minutes, "is to be assigned

to the height of the abacus, and the eight remaining to the height of the volutes. Then a line distant from that before let down at the orlo of the abacus in an inward direction from it, $1\frac{1}{2}$ part," equal to 5 minutes, "after this, the lines are to be so divided as to leave $4\frac{1}{2}$ parts under the abacus, and there a point fixed from which to the bottom of the volute are $3\frac{1}{2}$ parts, and that point is to be the centre of the eye, on which a circle is to be scribed, equal in diameter to 1 of the 8 parts, and this circle is the size of the eye, and a diameter must be drawn answering to the cathetus." The use of this circle will be fully explained by the discussion on some subsequent precepts. "Then begin at the top under the abacus, and each $\frac{1}{4}$ circle is to have it's radius shorter than the last, by $\frac{1}{2}$ the diameter of the eye, until you come to the place, where you began, under the abacus." Hence it is evident, the fixed leg of the compasses, in scribing the first quarter circle, is ordered to be set on the top of the eye, in the part of the circumference of the eye, intersected by the cathetus; and the first removal of the fixed leg, is to be to that part of the said circumference, intersected by the diameter answering the cathetus, i. e. at right angles with it; and the second quarter circle being scribed, the fixed leg removed to the bottom of the circumference, at the other intersection of the cathetus, the third quarter circle is to be scribed; and the fourth, by the last removal of the fixed leg, to the inward end of the eye's diameter; and, if removed again, it would be to the place you began with, as Vitruvius says; at each removal, it is seen the radius is shortened by $\frac{1}{2}$ a diameter of the eye, as ordered; so far is demonstration: then, continues Vitruvius, "the intire height is so to be di-

vided into $9\frac{1}{2}$, as 3 such parts may fall under the astragal of the shaft, the remaining part of the height, except what was assigned to the abacus and the channel, is for the cymatium or ovolo; and the projecture of the ovolo beyond the orlo of the abacus, is to be as much as the diameter of the eye." This projecture, or sally of the ovolo, from the orlo or square of the abacus is, then, $3\frac{1}{2}$ minutes; of course, as the abacus at it's orlo projects 35 minutes, from the central line of the column, the ovolo will project $38\frac{1}{2}$. Now the radius of the first quarter circle, is evidently 4 of the 8 parts, into which the height of the volute is divided; the radius of the second quarter circle, is $3\frac{1}{2}$; the radius of the third is 3; the radius of the fourth is $2\frac{1}{2}$; and this last radius, centering at the inward end of the eye's diameter, in turning the last of the four quarter circles, elevates itself exactly to the middle of the first radius, leaving just 2 parts = $6\frac{2}{3}$ minutes, under the abacus, for the breadth of the channel; which added to 5 minutes, the height of the abacus, produce $11\frac{2}{3}$ minutes, which Vitruvius subtracts from the $6\frac{1}{2}$ parts, out of the $9\frac{1}{2}$, after 3 were separated from them, as discarded, under the astragal; therefore $11\frac{2}{3}$ minutes, taken from $21\frac{2}{3}$ = the $6\frac{1}{2}$ parts, there remain for the ovolo and astragal 10 minutes. It is then again demonstration, there can be but $6\frac{2}{3}$ minutes for the height of the ovolo, called cymatium, in the text, if the height of the eye is allowed for the astragal. And it has been before ascertained, that the ovolo is to project $38\frac{1}{2}$ minutes; the height of it subtracted from that projecture, there will remain $31\frac{1}{2}$ for the projecture of the astragal; hence, is seen that Vitruvius intended the whole quarter circle profile, of the
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ovolo, to clear the projecture of the astragal : and every particular, in this exposition, is either clearly expressed in the text, or clearly deduced from what is so expressed. Vitruvius, then, describes the side form of the capital, which consists of a broad belt, in the middle of a convex surface, girthing, as it were, branches of leaves close together in the middle, so as to clear the astragal of the shaft ; and the extremities of the leaves gracefully spreading, right and left of the belt, terminate at the backs of the volutes ; these branches of leaves, thus confined, are fancied to resemble a pillow girthed in the middle ; hence, the capital itself, is named *pulvinatum*, by Vitruvius, who says, “ the projecture of the belts of the pillows, is thus found ; the fixed leg of the compasses placed in the centre of the square abacus, extend the other leg to the extremity of the ovolo in front, and turn it backwards to the middle of the side, and the point it comes to, is the projecture of the belt.” The belt, therefore, projects equal to the ovolo.

The things, which are so far clearly, and I will add, incontrovertibly proved, comprize the whole extent of the abacus ; it's height and projecture from the central line ; the exact situation and size of the eye ; the precise lengths of the 4 radii of the 4 first quarter circles of the volute ; the 4 central points, on the circumference of the eye, from which the 4 quarter circles are turned ; the breadth of the channel ; the height, projecture and situation of the ovolo, called *cymatium* ; the height of the astragal and it's projecture ; and, on the sides of the capital, the projecture of the belts.

But the particulars, which remain to be ascertained, whereof the intricacy is such, as completely foiled Per-

rault and other commentators, are the breadth of the rim, which accompanies the volute in it's revolutions, and borders the channel; the situation of the 8 other centres, whereon to scribe the other quarter circles to complete the volute; and what depth the channel is to have from the face of the volute.

Now as to the 8 centres, Vitruvius is argued, both by Perrault and other commentators, to have left no document in his verbal description, that indicates where those centres are to be placed; but I pledge myself to prove, he has. And his documents as to the breadth of the rim of the volute &c, are misconceived by all the moderns. The remaining part of his description, is as follows;

"The axes of the volutes, are not to exceed the size of the eye, and the volutes themselves are to be so cut, as to have of height $\frac{1}{2}$ part of their own expanse."

It must be observed, both in these two last precepts, and in most parts of the description, Vitruvius alludes to all the four faces of volutes, his terms are therefore in the plural: but in the exposition following, I shall assume only one face of a volute. The first of these two precepts, I maintain, decides where the 8 centres must be, whereon to scribe the other 8 quarter circles, which in the sequel I shall call quadrants.

The meaning of *axis*, here, cannot be that imaginary line, in geometry, which passes through the centre of a globe or cylinder, but must be that, which in mechanics, is called *axis in peritrochio*, and is a cylindrical beam, about which ropes revolve, in drawing up burthens of great weight.

This is, no doubt, the kind of axis to which Vitruvius

rius alludes ; and here signifies an imaginary cylinder passing from the face of the volute on one side, through the pillowed flank of the capital to the other opposite face, at the back of the capital ; and as this cylindric form can only be in view at it's ends, they exhibit those ends, as circles on the faces of the volutes, on which circles the volutes, front and back, are with their rims and channels, involved ; which rims and channels, commencing in an angular point, to be imagined fixed on the axis, and spread wider and wider as they rolled up, by the supposed turning of the axis ; and of a sufficient length and spreading width, to cause three revolutions of the axis to conduct their other end just under the abacus. Now this operation, though imaginary, explains an effect which is real : and it can easily be conceived, the larger the axis, the fewer the revolutions will be, in conducting the given length to it's station ; therefore, said Vitruvius, "the axis shall be no thicker than the size of the eye". So that this very circle is the eye, when it contains the 12 centres of the 12 quadrants ; and is the axis, when the upper end of the limb of the last quadrant terminates, or rests its angular point, on it's top : for as in the above theory, the swathe comprizing the rim and channel was imagined to terminate in an angle at the end fixed on the axis ; so here, in actual practice, the second 12 quadrants forming the breadth of the rim, are to come to an angular point with the first 12, and close with them on the top of the axis. Hence it is evident, that, if 8 centres are regularly so disposed in the eye, as to cause the limb of the last quadrant, scribed on the last centre, to terminate on the top of the said circle, they will be disposed, as intended by Vitruvius, who must then be argued to have

have left a document, by giving the size of the axis, which virtually teaches, where the 8 centres are to be. If it should be objected, this exposition is prolix; I answer, that is the reason Vitruvius declined the demonstration it contains, and refers to an explanatory design, which being lost, the above explanation, however prolix, is at least both necessary and interesting; since by this one precept left us, his explanatory design, may easily be drawn, and the loss retrieved. I maintain, then, to cause the last quadrant to close as above, two other circles, drawn on the same centre, within the circle of the given eye, at equal distances, from the present circle, from each other, and from the common centre, will, by each being used as the first was, furnish the eight centres in question: since the cathetus, and diameter equally pass through the two inscribed circles, and direct the places on their circumferences for the fixed leg of the compasses. Now to cause the middle circle to have it's due distance from the outer, and from the third circle, the diameter of the outer circle, i. e. the diameter of the eye, is to be divided into six equal parts, and each part will be $=\frac{1}{6}$ of a minute; it is evident the diameter of of the middle circle has 4 such parts $=2$ minutes and $\frac{2}{3}$; and the inner circle 2 such parts $=1$ minute and $\frac{1}{3}$. Then, to return, as the radius of the fourth quadrant. elevated itself from it's centre, at the inward end of the eye's diameter, to the middle of the four parts between the eye and the soffit of the abacus; it is again evident, the length of that radius takes up two of the four parts above the eye, with the additon of $\frac{1}{2}$ the erect diameter of the eye, formed by the cathetus; these together are $=8$ minutes and a third: then, the fixed leg of the compasses placed
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in the top of the middle circle in the eye, and the other leg extended to the point, where the fourth quadrant terminated, that will be the radius of the fifth quadrant; evidently shorter than the fourth, by 2 of the 6 parts, into which the diameter of the outer circle was divided, equal 1 minute and a ninth; the radius, therefore, of the fifth quadrant will be 7 minutes and two ninths: and the radius of the sixth quadrant centering from the end of the diameter of the middle circle will be shorter than the last radius, by $\frac{1}{2}$ the diameter of the said circle, i. e. by 1 minute and a ninth; its length, therefore, will be 6 minutes and a ninth: and, of course, the radius of the seventh quadrant, centering from the bottom of middle circle, and shortening the same, will be exactly 5 minutes: and the radius of the eighth quadrant, centering from the inner end of middle circle's diameter, and shortened by the said half diameter, or 1 minute and a ninth, will be 3 minutes and eight ninths: then removing to the top of third little circle, it is evident, the radius of the ninth quadrant, will be shorter than the last, by one of the six parts, i. e. by five ninths of a minute; therefore the length of the ninth quadrant will be 3 minutes and three ninths; and the radius of the tenth quadrant, centering from the end of the diameter of the third circle, and shortened by half a diameter, i. e. by five ninths of a minute, will be 2 minutes and seven ninths: and the radius of the eleventh quadrant, centering from the bottom of the little circle, and shortened by five ninths, will be 2 minutes and two ninths: and the twelfth and last radius, centering from the inner end of the little circle's diameter, and shortened by five ninths, will be 1 minute and six ninths, i. e. 1 minute and two thirds; which exactly terminates on the
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top of the outer circle, *now* become the axis of the volute: and the demonstration is irrefragably established: and though it might have been deduced in a more concise expression of geometrical terms, yet they might not, perhaps, be so well comprehended by all descriptions of practitioners, as the terms I have used.

In turning the quadrants, the practitioner must carefully attend to this caution, not to exceed the 90 degrees, in order to connect the limbs of the quadrant, but must supply by hand, what is wanting between the termination of one, to the commencement of the next; otherwise he will be embarrassed: each radius should be taken, in the compasses, from a scale of minutes nicely divided, with 1 minute divided into 9, that being the least denominator he will require.

The modern method of turning the four first quadrants, is, by placing a square, the side of which is equal to half the diameter of the eye, in the middle of the circle of the eye; and from the corners of it, as from centres, are scribed the quadrants; and two other squares, within the first square, furnish the other 8 centres. This method is said to have been discovered by Palladio, and communicated by him, to the Patriarch Barbaro, from a capital in an ancient ruin, which had been half imured; and when disengaged from the wall, exhibited, on it's unfinished half, the 12 points forming the corners of these 3 squares. This was thought a valuable discovery, and has been adopted by most of the moderns; and they, who have invented other devices, have certainly wandered still further from Vitruvius's document; which, on mature examination, and correct revision of the text, I am fully convinced, is far preferable to Palladio's discovery: though in fact they both will

will cause the last quadrant to close on, or opposite to the point at the top of the eye: hence I was, till of late, satisfied with that invention of his; and took credit to myself only for the discovery of the true breadth of the rim of the volute, and the situation of the 12 other centres, from which to scribe the inner involutions, conformably with the precept of Vitruvius, and published my demonstrations in the Gent. Mag. and which I do not here retract, but only proceed to shew in what particulars Vitruvius's method, rightly understood, surpasses that by Palladio, for scribing the twelve first quadrants.

First, in Vitruvius's method, commencing on the top of the circle of the eye, at the intersection of the cathetus, and assuming for the first radius, a line from that point, to the top of the cathetus, at the soffit of the abacus, the limb of the first quadrant will be exactly 90 degrees, when the bottom of the limb touches the horizontal line, drawn from the top of the eye: but in the other method, the centre of the first quadrant is a quarter of the diameter of the eye, more distant from the soffit of the abacus, and $\frac{1}{4}$ of the said diameter more inward from the cathetus; of course the radius being longer, though the lower end of the limb touches the horizontal line, drawn from the upper side of the square in the eye, the other end of the limb terminating at the cathetus under the abacus, will not complete the quarter circle, or 90 degrees, by the distance from the cathetus of $\frac{1}{4}$ of the diameter of the eye, and thus becomes the segment of a larger circle, than that of which Vitruvius's quadrant is $\frac{1}{4}$ part; and the curve, of consequence, flatter, and not so graceful, as in Vitruvius's method.

Secondly, the centres from the corners of the squares,

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supersede the use of the cathetus, and diameter of the eye, which were evidently intended by Vitruvius, to ascertain the centres, on the circumference of the eye, and not from a square within it: nor has such a circle as Vitruvius appointed for the eye, any thing to do, in settling centres from three such squares, as the method, by Palladio, requires. But enough, and more than enough, on a matter so clear.

Now to turn the second twelve quarter circles, to form the breadth of the rim, divide the $\frac{1}{4}$ of the circle of the eye, into 6 equal parts, and set on 1 such part, from the intersection of the cathetus, and outside of it. This may be done, either by dividing $\frac{1}{2}$ the diameter of the eye into 6, or $\frac{1}{2}$ the portion of the cathetus which forms the perpendicular diameter of the eye, and each of these parts is evidently $\frac{1}{2}$ of a minute: then by an ordinate, at right angles with the cathetus, from the point of the 6 divisions nearest to the top of the eye, transfer the ordinate to the circumference; and the point of intersection, will cut off exactly $\frac{1}{6}$ part of the $\frac{1}{4}$ circle of the eye; taking that distance in the compasses, set it on the circumference, at the other three ends of the diameters respectively, and draw a radius from each of these four points on the circumference, to the centre of the eye; and these radii will evidently intersect the 2 inner circles, in points in the same ratio. And I will now demonstrate, that from these points, or centres, and from no others elsewhere placed, the true breadth and regular contraction of the rim of the volute will be produced, according to the mind of Vitruvius; who expressly says, "the *volute itself*," viz, the tapering fillet, which exhibits the three involutions, commencing at the top of the face of the stone prepared for it, and

and terminating in a point on the top of the axis, "shall be so cut, as of the height there may be $\frac{1}{12}$ of it's own expanse, (*latitudinis suæ.*")

The first greatest expanse is equal to all the 8 parts, each $3\frac{1}{2}$ minutes, from the soffit of the abacus to the bottom of the volute : and $3\frac{1}{2}$ multiplied by 8 = $26\frac{1}{2}$ minutes, of which, $\frac{1}{12}$ is = $2\frac{1}{6}$ minutes ; the height, then, of the rim, at the soffit of the abacus, is to be $2\frac{1}{6}$ minutes : then the next largest expanse is evidently composed of the radius of the first quadrant = $13\frac{1}{2}$ minutes, added to the radius of the third quadrant = 10 minutes ; the sum of these is $23\frac{1}{2}$ minutes, of which $\frac{1}{12}$ is = $1\frac{1}{4}$ minute ; the rim, therefore, at the junction of the limb of the first quadrant, with the limb of the second quadrant, is $1\frac{1}{4}$ minute : then, if the distance from the thirteenth centre, on the circumference of the eye, to the point of contraction of the rim under the soffit of the abacus, is equal to the distance from the said centre to the point of contraction, at the junction of the first, with the limb of the second quadrant, it will be demonstrated, that centres placed at $\frac{2}{3}$ part of the $\frac{1}{3}$ circle of the eye, from the other 3 first centres, the radii from them will properly and equally scribe all the second set of quadrants ; and the contraction of the rim, will be every where exactly $\frac{1}{12}$ of the expanse of the volute respectively, throughout the 3 circles of the eye.

Now, it is known the radius of the first quadrant was = $13\frac{1}{2}$, and the thirteenth centre on the circumference of the eye is distant from the soffit of the abacus $\frac{2}{3}$ more, than the first distance taken from the top of the eye ; consequently the thirteenth radius, before any deduction is made for the breadth of the rim, must be $13\frac{1}{4}$, and if this length of radius on this centre were to

be turned downwards till it becomes horizontal, it is evident, it would extend to a point just $\frac{1}{8}$ beyond the end of the limb of the first quadrant, because the centre it proceeds from, is $\frac{1}{8}$ distant from the cathetus; therefore to shorten the radius equal to the distance from the centre to the point of contraction, which contraction is $1\frac{1}{8}$, this added to $\frac{1}{8} = 2\frac{1}{8}$ must be subtracted from the $13\frac{1}{8}$, the primary length of the radius, there remains $11\frac{1}{8}$; and this length turned up again to a perpendicular, will be just $2\frac{1}{8}$ short of the soffit of the abacus, which $2\frac{1}{8}$ is there the breadth of the rim, in the same ratio of contraction, as $1\frac{1}{8}$ is the breadth at the junction of the limbs of the 2 first quadrants. Thus is demonstrated, that the second set of 12 centres are to be placed on the circumference of the 3 circles respectively, at the distance of $\frac{1}{8}$ of the $\frac{1}{4}$ circle from the first 12 centres, And radii from them so placed, and from no other situation, will duly contract every part of the rim to a breadth equal to $\frac{1}{8}$ part of the respective expanse of the volute. Let the practitioner carefully mark all the points of contractions, i. e. $\frac{1}{8}$ of height from abacus to bottom of volute, which I call its greatest expanse; the next expanse from out to out of volute passing through diameter of the eye; third expanse, from bottom of volute passing along the cathetus upwards within 2 of the 8 parts, which compose the height of the volute; fourth expanse, from the junction of the third and fourth quadrants, to the junction of the fifth and sixth quadrants, passing through the diameter of the eye; fifth expanse, from the junction of the fourth and fifth quadrants, to the junction of the sixth and seventh quadrants, passing down by the cathetus; sixth expanse, from the junction of the fifth and sixth quadrants, through

through the diameter of the eye to the junction of the seventh and eighth quadrants : and so proceed with the rest. And thus will be completed the most beautiful figure in the power of art to perform with the compasses; and far superior to the volutes got out by any of the modern devices. And in the reformed capital, by Michael Angelo, now usually adopted, this true method of turning the 3 circumvolutions, thus taught by Vitruvius, equally obtains, notwithstanding the crescent form of the faces of the capital.

Perrault, at first setting off, in his comments on Vitruvius's description of this capital, with the 5 minutes projecture of the abacus, is extremely feverish; calls it enormous, and for no other reason, than it's non-conformity with the less projecture in some of the instances of the Roman antique. But if his prepossessions in favor of that school, would have left him the free use of his reason and judgment, one might have expected his complaint would have been of it's small projecture, when contrasted with the great projecture of the ovolo under it, to which the abacus is to be imagined a protection. But, determined to prefer the Roman symmetries, he had recourse to his usual expedient, to represent Vitruvius to be of his opinion by changing the text to what he would persuade us was the true reading. Thus after Vitruvius had ordered the diameter to be divided into 18 parts, each equal to $3\frac{1}{2}$ minutes, in order to assign 19 such parts to the extent of the abacus, and $\frac{1}{2}$ that extent to the height of the capital inclusive of the volute, equal to $31\frac{1}{2}$ minutes, he immediately ordered lines called catheti to be let down against the faces of the volutes, at an eighteenth part

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and $\frac{1}{2}$ from the square or fillet of the abacus inwards ; and Perrault perceived, this precept gave 5 minutes projecture to the abacus : and as Vitruvius in settling the extent of the abacus, used the term *octavdecima*, for eighteenth : and in directing the point for the catheti, said *parte duodevigesima* ; also for $\frac{1}{2}$ part ; Perrault proclaims a corruption of the text, because, said he, Vitruvius was not accustomed to vary his expressions ; and the copiest mistook, and wrote *duodevigesima*, instead of *duodecima* ; and Perrault's sagacity we are called upon to admit, was so penetrating, as not only to discover the term Vitruvius wrote, instead of *duodevigesima*, but also 3 or 4 other words, which he tells us Vitruvius forgot to write : for, compelled to ask himself for an integer, whereof to assume this twelfth part and a half, he very deliberately says, Vitruvius forgot to mention it, but that it should have been the *whole height of the capital!* and these words Vitruvius forgot to write ! and I will add, what is very surprising indeed, that, admitting the solidity of Perrault's extraordinary assertion, Vitruvius was such a dotard, as not to recollect that omission, when, immediately after, he orders the whole height of the capital to be divided into *nine parts and a half!!!*

Such are the subterfuges Perrault had recourse to ; sometimes, as here, to assimilate the documents of Vitruvius to the Roman antique, and frequently to avoid the humiliation of saying, *nescio*. So degradingly has he decomposed this beautiful capital, which Vitruvius took more than usual pains to guard from innovation, and misconception, as scarcely to retain any part of it, as he orders it ; and yet published a design, completely his own, for the Ionic capital of Vitruvius. The breadth
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of the rim he makes $\frac{1}{2}$ the diameter of the eye, mistaking $\frac{1}{2}$ of the expanse, for $\frac{1}{4}$ of the rim, and assigns it to the relief of the rim from the ground of the channel : on purpose, gives a different projecture to the abacus, by taking $1\frac{1}{2}$ of a division of 12, instead of a division of $9\frac{1}{2}$: thought the axes volutarum, meant the thickness of the volutes on the flank : changed Vitruvius's direction, for finding the projecture of the belt on the side of the capital, from tetrante capituli, to, tetrante volutæ ; and explains the method of performing it in a very confused way. Sets off the first quadrant of the volute, in common with other moderns, from a centre not taught by Vitruvius, rejecting what he really ordered to begin at the top of the circular eye : and, with other moderns, produced an irregular contraction of the rim, by erroneously placing the second set of twelve centres. And, to supersede several other mistakes, he injudiciously asserts the second line ordered by Vitruvius, to be transferred from the cathetus to the face of the marble prepared for the volute, to be useless : on this line are marked the 8, of the $9\frac{1}{2}$ parts into which the height of the capital is ordered to be divided ; and surely the utility of it, as well as of the cathetus that directed it's station, will be acknowledged by any mason who should have such a design to execute. And one would conclude the satirist gave more than was due to Perrault, when he published his lampoon, "That the new academy had given a fresh instance of their sagacity, for, of a *bad physician* they had made a *good mason*:" it should seem, then, from his above assertion, there was more truth in the explanation of the satire : when the mortified academician called on the author for satisfaction for such personality ; he argued he could
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not mean Perrault, for, said he, "that you may be a bad physician, I will not dispute, but I write more accurately, than to call *you* a good mason."

The Corinthian capital, said to have been invented by Callimachus, who was styled Catatechnos by the Athenians, on account of his refined taste and elegance, in designing and carving in marble; according to Vitruvius, has the following symmetries; the height including the abacus, is equal to the diameter of the shaft of the column: the breadth of the abacus, is to be, between the extremities of the horns, equal to the side of a square, whereof the diagonal is equal to 2 diameters of the shaft; and this will be found, 1 diameter, 24½ minutes, very nearly. Then having made a geometrical square, whereof the diagonal is 2 diameters, and each side, of course very nearly 84½ minutes, Vitruvius orders each side to be hollowed, in a crescent form inward, in the middle equal to $\frac{1}{7}$ part of a side, i. e. 9 minutes and full $\frac{2}{7}$. To find a centre, whereon to scribe such a segment of a circle; continue the diameter of the square outwards at discretion, and fix a point from the intersection of the side and the diameter, inwards on the diameter, at $9\frac{2}{7}$ minutes from the said intersection. Then with the fixable leg of the compasses somewhere on the continued line of the square's diameter, make trial, until the scribing leg will touch each corner of the square and the said fixed point; and scribe the crescent, at each side; this will produce 4 sharp corners, which are called the horns of the abacus, which the moderns cut off. Perrault professed to have scribed this crescent, as Vitruvius directs, which he has by no means performed; for, after cutting off the horns, he left the distance from the front to the point at $9\frac{2}{7}$ minutes,

minutes as before, and brought the corners of the modulation forwards till they touched the said front line, thus changing the segment of the circle, which, taken from the points of the horns, was about 50° , to exactly 60° .

This deviation from Vitruvius's document, by cutting off the horns of the abacus, is attended with such appearances as would not, I am well satisfied, have intitled the inventor to share with Callimachus the honor of, *catatechnos*, had he lived in that age. It causes the junction of the volutes at the angles to be broader, and of a heavier aspect, than Vitruvius intended, or than suits the delicacy of the front aspect. And must either contract the projectures of the volutes, or expose a part of their top without the natural cover of the abacus.

There is a singularity in the mouldings that compose this abacus, viz, a hollow, then a fillet, and at top a quarter round. The hollow is called by the Italians *cavetto*, the round they call *ovolo*: and I have some reason to conclude, this latter is what some have denominated the Lesbian astragal, about which there is a great variety and uncertainty of opinion. We have seen Vitruvius named this moulding, *cymatium*, in the Ionic capital, alluding merely to it's form of profile; in the Doric capital he calls it, *echinos*, clearly on account of the carving it usually receives. But the quarter circle hollow has no denomination from Vitruvius, though he twice alludes to the use of it, viz, the apophyge of the shaft, which is a small quarter circle hollow; and the apothesis, a similar hollow from the upper part of the shaft to the cornice or fillet, that terminates the shaft; but this hollow obtains not these names out of those situations.

when it exceeds the quarter circle, he calls it, invariably, scotia: and these are all the mouldings of curved profiles, mentioned by Vitruvius.

The height of the abacus he orders to be $\frac{1}{4}$ part of the capital = $8\frac{1}{4}$ minutes : the remainder of height he divides into 3 parts, each = $17\frac{1}{4}$ minutes ; one part he assigns to the lower range of leaves, one part to the second range, and one to the caulicoli, or little stems, out of which rise the spreading leaves turning at the soffit of the abacus: the volutes, springing from between the leaves, project to the extremity of each horn of the abacus ; and the little volutes (helices) are carved with the flowers between them, which over-hang from the abacus: these flowers, in the 4 middles of the abacus, are to be as large, as the profile of the abacus. In these symmetries the Corinthian capitals will be duly disposed. So far Vitruvius.

Perrault, in a summary way, tells us the text from the words, "The volutes springing" to the end of the period, is corrupted, and that he has followed the correction of Philander, but says not what part is corrected. Probably, the copy of Philander and his, were different from that of Jocundus, in which I read, "*quæ ex caulicalorum foliis natæ procurrunt ad extremos angulos volutæ, minoresque helices intra suum medium qui sunt in abaco floribus subjecti scalpantur.*" In English, "the volutes produced from the leaves of the stems extend to the extreme angles, and the lesser helices are carved with the flowers between them, which are over-hanging from the abacus." This appears to me very intelligible ; nor is there any correction in Perrault's French version, except the omission of a word for *scalpantur*.

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The general symmetries of this capital is all that Vitruvius has precisely noticed ; as, indeed, vain would be the attempt to describe all the niceties of the volutes, the raffles of the leaves, the enrichments of the stems &c, to all which, words are unequal ; all we can say will fall short of the perfections of this masterpiece of art. The competent architect, however, though not trained to the use of the chissel, ought yet to be so well skilled in the use of the pencil, as to have it in his power to design this capital so correctly, as to convince the carver, no liberties or intemperate flights of his fancy, will pass without notice and censurè. Many carvers are better acquainted with certain niceties performed by the tool, as correct sweeps, delicate veining, and true raffles, than with the nature of symmetries : and, unfortunately, they who know the least, are, as Mr. Evelyn long since complained, the most unwilling to be taught, deeming the use of their tools all the knowledge they want. And, in truth, the greatest attention to symmetries without that, will produce but an imperfect work. Much, undoubtedly depends on the carver's taste and skill, and when these combine with a knowledge of exact symmetries, a beauty and perfection will be produced in this capital, which no artist can hope to surpass. The acanthus, originally designed by Callimachus, will best accord with Vitruvius's symmetry of one diameter ; and the ladrel, or olive, perhaps, will appear to more advantage in the modern height of about 70 minutes.

Vitruvius orders the bottom of the capital to be equal to the upper part of the shaft, under the apothese ; but as this, according to his notion of optical effects, is liable to variation, he has left this symmetry

undetermined; and the reason assigned by him for a second symmetry of the Ionic capital, on columns very high, and of small contraction of the upper diameter, certainly obtains in this Corinthian capital. And his omission of that provision here, is another argument against his optical precept: and shafts of all heights should have one and the same contraction, viz, the upper diameter 50 minutes.

SECT. VIII.

Of the symmetries of Entablatures.

VITRUVIUS, in a short chapter, explains the origins of carpentry, which have given rise to the various denominations of ornaments in freezes and cornices of entablatures, and some other objects. The substance of this chapter, is, that columen, which we call the king-post in a roof, gave the name, *columna*. Canterii, by us called, *principals*, in the bands of a roof; these, he says, projected to the extremity of the eaves, and under the ends of them were cut the pendant drops, which gave rise to the ornaments called *mutiles*. Across the principals were the *templa*, by us denominated, *purlins*; over these the *assares*, in the same direction as the principals, from ridge to eaves, these *assares* answer to our, *spars*, or small rafters; and the ends of these gave, he says, the idea of *denticules*; and, that the ancients allowed them not to have place under *mutiles*, because, the nature of their situation above the *canterii*, or principals, forbid them to be under *mutiles*. And, in the beginning of the chapter, he teaches, that the *tigna*, or *joists*, the ends of which passing through the walls, and cut off flush, were thought to be unsightly, were therefore

therefore, eased with thin pieces of board, cut in glyphs, and painted with red wax; hence is derived the ornament called, *triglyph*: and that cavities were left in the masonry, for the reception of these ends of joists, and similar cavities also, for the ends of spars, which holes, or cavities, the Greeks called, *τρῶες*, and the Italians nick-named them *pigeon holes*; hence, he says, the spaces between these, *τρῶες*, were denominated, *μικτρῶες*, which proves, by the bye, this term should be wrote metope, not methope; for *τρῶες*, with an asper, has a different signification. The ancients, he tells us, when they imitated these inventions in stone, or marble, judged the very same dispositions and forms should be retained, since what existed in fact, should not be omitted in picture. And he explodes the opinion of the holes, left in the masonry, for triglyphs and denticules, being originally intended for windows; because, says he, a triglyph has place at the angle, where a window could not be made. This is the substance of the chapter; and his observations are realized, in the Parthenon at Athens.

Vitruvius, however, does not servilely follow the injunctions contained in this chapter of origins, when he gives the denticules place immediately on the Ionic freeze; for to suppose the ends of the assares or spars, to be there in sight, is manifestly to imply, that the principals of the roof were lodged on the epistyles, and *their* ends are said to have given rise, not to *triglyphs* in a freeze, but to *mutiles* under the assares, and above the freeze, which freeze receives the ends of the tigna, in joists, which reposed on the epistyles. And, since Vitruvius took a liberty himself, with these ancient origins; we may conclude, they began to be a little
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out of countenance, at the time Vitruvius wrote. But to proceed with the particulars appropriate to entablatures, according to his documents ; and first,

The Corinthian Entablature, he says, had no appropriate ornaments of it's own; but borrows it's constituents partly from the Doric style, as mutiles in the soffit of the corona, and the guttæ or pendent drops in the epistyles right under the mutiles above; and partly from the Ionic, as foliage, or other sculpture, in the freeze, with denticules over it ; and thus produced a third composition of work over Corinthian columns.— Hence is seen the error of those, who assert Vitruvius has assigned only one and the same entablature, to both the Corinthian and Ionic style. The symmetries, indeed, of this third kind, he has left to be determined by those he prescribed for the Ionic ; of which presently. But it must here be observed, the modern modillions, though of undeniable beauty in themselves, are not authorized in such form and symmetries, by the mutiles, to which Vitruvius alludes ; intended, by him, to have pendent drops, as in the Doric ; since he ordered corresponding guttæ in the epistyles : and certainly, the height modillions generally have, is subversive of the primary design of those ornaments; and, in such a bold symmetry, they give the cornice a heavy appearance. The decorating of their soffits with the same leaf, as the capitals have, is, doubtless, an improvement; and were the scrolls, to which the leaves adhere, reduced in thickness, the leaves somewhat broader and of less projecture, than they are usually made ; in my humble opinion, the aspect of the cornice would be more airy, elegant, and light. But, when these modillions, so very foreign from the original mutiles, are assumed, certainly the guttæ should be omitted

omitted in the epistyle, since they have no kind of relation to such modillions.

And, I here enter my irrevocable protest, against the modern practice, of crowding the Corinthian cornice with a plurality of mouldings, over and above the denticules and mutiles, or modillions, assigned by Vitruvius. They have the worst possible effect, by rendering this cornice, which ought to be light, airy and elegant; a confused, heavy, indistinct collection of mouldings without design, authority, taste, or decorum: causing a violent excess in the intire projecture: altogether a cumbersome, ill-judged mass, appearing to overload the most slender of all columns; of which the symmetry is imagined to represent a virginal delicacy. What this cornice ought to be, will be seen, after the symmetries of the Ionic are discussed.

The Ionic entablature is composed of the epistyles, barbarously called *architrave*; the freeze, or zophorus, the denticules, and the corona; each having it's due cymatium. The symmetries of these members depend on the middle fascia of the epistyles; and the greater or less altitude of epistyles, from the level of the ground, according to Vitruvius's idea of optical effects, determines the height, or thickness, of the epistyles, in the following ratio: columns, says our master, from 12 to 15 feet high, shall have their epistyles 30 minutes high; if 20 feet high, $\frac{1}{11}$ of the column's height, shall be the height of the epistyles; if 30 feet, $\frac{1}{12}$: if 40, $\frac{1}{14}$: if 50, $\frac{1}{16}$: if 60, $\frac{1}{18}$: if 70, $\frac{1}{20}$: and so on.

Now, if the practitioner chuses to amuse himself with the calculation, he will discover, that, taking the symmetrical height of the Ionic column at 9 diameters, the height of the entablature in columns of 15 feet high,
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(all the members rated, as Vitruvius directs, and as seen beneath, by the epistyles,) will be one diameter and $34\frac{1}{2}$ minutes. Then take a column 70 feet high ; the optical rule is, the epistyles shall be $\frac{1}{4}$ of it's height, = $8\ldots 9$. And the symmetrical height as before ; the diameter will be $7\ldots 9\frac{1}{2}$. Now as $7\ldots 9\frac{1}{2} : 60$ minutes $:: 8\ldots 9$ to $67\frac{1}{2}$ minutes, for the height of the epistyles. Then as 30 minutes, before, produced an entablature of one diameter, $34\frac{1}{2}$ minutes ; so $67\frac{1}{2}$ will produce 3 diameters and 32 minutes. Such an entablature, so considerably more, than $\frac{1}{4}$ part of the height of the column, whatever it may have been deemed by the ancients, must, in these times, be condemned as extravagant and intolerable. Yet, there is reason to conclude, the ancients were governed by some such optical rules, though not, perhaps in the precise ratios here established by Vitruvius. But, as his reasoning on the optical effects, has been refuted, and the principle itself found, by experience, to be erroneous ; while we strictly adhere to his assumptions from the epistyles, for the symmetries of the freeze and cornice ; a more certain rule must be devised, whereby the height of the epistyles themselves, may be duly settled and fixed. Nor is it a satisfactory conclusion, that the half diameter, or 30 minutes, which he left as a stable height, when columns are of any size under 15 feet, should be adopted after the exploring the fallacy of his optical rule ; because, there is reason to suspect, that he commenced his progressive increase of heights, from that low symmetry of 30 minutes, the better to restrain the excess, into which he perceived his ratio of increasing heights would lead. Rejecting, then, both extremes, I propose to adopt such a height of epistyles, as will, (when divided for

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it's own symmetries as he directs and by his assumptions from them, to adjust the freeze and cornice,) produce an intire height of entablature, equal to 2 diameters, for the Ionic and Corinthian styles.

This height of entablature, I conceive, is a becoming medium between one diameter, 34 minutes; and 3 diameters, 32 minutes: as few columns are more than 70 feet high, and many above 15 feet.

Perrault has adopted 2 diameters for the height, in all the five kinds of columns, but I think the Tuscan should not be so high, that entablature being altogether different from others. And Perrault assigning 2 diameters to the Doric entablature, and retaining only the 30 minutes given by Vitruvius to the height of the epistyles, betrayed himself into a great mistake: for both epistyles and freeze taken, as he found them in Vitruvius, to cause the cornice to rise sufficiently to complete 2 diameters, he has made it enormous, and foreign from the description of Vitruvius, and from all principles of Grecian architecture. But of this more, when the Doric is treated of.

The symmetries of the Ionic entablature, then, shall be regulated, as Vitruvius orders, by the epistyles; whereof the height, taken at $38\frac{1}{2}$ minutes, is to be divided into 7 parts, one such part= $5\frac{1}{2}$, nearly, for the cymatium; the remainder divided into 12, of which $3=8\frac{1}{2}$ minutes for the lower fascia; $4=11$ minutes for the middle fascia; and $5=13\frac{1}{2}$ for the upper fascia. The freeze, with sculpture, the whole height of the epistyles and a quarter added= $47\frac{1}{2}$ minutes, it's cymatium included; denticule and cymatium 11 minutes; corona and cymatium also 11; sima $12\frac{1}{2}$ minutes. All these are as Vitruvius orders respectively, and their

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sum is just 120 minutes, equal to 2 diameters : and for the Ionic entablature only.

But in the Corinthian cornice, for the modern change of the mutile, (which in Vitruvius's idea, was to be sunk into the soffit of the corona,) into the ornament denominated modillion, provision must be made in the assignment of the several symmetries, that it may not cause their sum to exceed 2 diameters. Therefore, I will assume for the height of the epistyles 36 minutes, and dividing as in the Ionic, the lower fascia $7\frac{1}{2}$ minutes ; middle fascia $10\frac{1}{2}$; upper fascia $12\frac{1}{2}$; cymatium $5\frac{1}{2}$. The freeze 45, including it's cymatium ; denticules $10\frac{1}{2}$, cymatium included ; modillion $6\frac{1}{2}$; corona $10\frac{1}{2}$; Sima $11\frac{1}{2}$. And the cymatium, which turns, and returns about the scroll of the modillion, should be sunk into the soffit of the corona ; and the roses in the intermodillions, or coffers, should also be cut out of the soffit itself, with a drip at the chin of the corona. The sum of these severals, will be also 120 minutes, equal to 2 diameters.

Before I state Vitruvius's symmetrical projectures of the members of the Ionic Entablature, the reader will please to mark, that by projecture, is signified the distance from the central line of the column, continued through the entablature, to the extremity of the members respectively ; but by sallies, is to be understood the distances of members from those immediately under them, or from the under part of the shaft of the column. Vitruvius was obliged to assume the latter method, because both the lower fascia of the epistyles, and the line of the face of the zophorus or freeze, depend on the contraction of the upper part of the shaft, which, according to his erroneous notion of optics, is subject to almost

almost an endless variation. But I have before shewn reasons for fixing this contraction, by a diameter at top of 50 minutes, in every possible height of columns whatever; therefore, I shall express the distances of his sallies, by adding 25 minutes, and call them projectures.

The projecture of the lower fascia, he orders to be 25 minutes from the central line: and of the top of the upper fascia he fixes the projecture at 30 minutes; this upper projecture, appearing to cause the sallies of the fascias to be $2\frac{1}{2}$ minutes; Perrault concluded the 30 minutes were intended for the projecture of the *cymatium* of the epistyle, and drew his explanatory design, in his xix plate, accordingly: and by this, his premature decision, he violated one of our master's essential precepts, that all sallies should be equal to the height of the member, which sallies; and the height of this *cymatium* is $5\frac{1}{4}$ minutes at least; so that, without violating this precept, as he understood the matter, the fascias could have no sallies at all: but another precept, which Perrault lost the recollection of, sets all to rights; which is, that "the faces of all members, fascias, freeze, denticles, corona, are to over-hang at top $\frac{1}{2}$ part of their height: in order that they may appear to the eye to be perpendicular." Now, supposing the height of the epistyles was only 30 minutes, $\frac{1}{2}$ part of 30 is 15 ; therefore, the projecture at top being fixed at $\frac{1}{2}$ a diameter, a line let down from that point, and drawn inwards at bottom $2\frac{1}{2}$ minutes; the distance, between the bottom of the lower fascia, and the bottom of the line, will be also $2\frac{1}{2}$ minutes; consequently, each sally of the fascias, will have but $1\frac{1}{2}$ minute; and will evidently have less; when the epistyles are higher, and the contraction of

the shaft less, as in that case the projecture of the lower fascia is, sometimes, according to Vitruvius, 26 or even 27 minutes.

Now, although the principle of optics, on which Vitruvius founded this rule, is denied, the document itself is perfectly intelligible; and, by it, we know the mind of Vitruvius was to allow about one minute to the sally of each fascia. His rule, then, that elevated objects must stoop, in order to appear erect, being discarded, and the incidental effect only, attended to; his symmetries for these projectures, are, the lower fascia 25 minutes; the middle fascia 26; the upper fascia 27, and their fronts or faces perpendicular; then the projecture of the cymatium $32\frac{1}{2}$; the freezes 25; it's cymatium $31\frac{1}{2}$; the sally of the denticules, Vitruvius orders to be equal to their height, which, inclusive of the cymatium, is 11 minutes; and the height of the cymatium $\frac{1}{2}$ of that = $1\frac{1}{2}$; (but to avoid this fraction it may as well be 2 minutes;) then, without the cymatium, the height of the denticules will be 9 minutes; and the projecture $40\frac{1}{2}$; the projecture of it's cymatium $42\frac{1}{2}$; the corona with the sally and cymatium, the same as the denticules; projecture of it's face $51\frac{1}{2}$; it's cymatium $53\frac{1}{2}$; lastly, the Sima, being $12\frac{1}{2}$ high, will project, at it's orlo or square, $66\frac{1}{2}$. And the intire cornice, including the cymatium of the freeze, will have it's sally from the face of the freeze, exactly equal to the height, (including also the cymatium of the freeze,) as well as each member had respectively. Which is what Vitruvius expressly orders for this Ionic Entablature.

But the Corinthian cornice, by the admission of modillions in the soffit of the corona, will not exactly assimilate it's height to it's sally, even in the moderate height

height and sally of the modillion, I have adopted. Yet, certainly, all the projectures of the members beneath, ought to conform to the symmetries established by Vitruvius: the heights which I have assigned to the members, are strictly such as he orders, by a division of the height of the epistyles: but, as they require a minute to be parted into seven, to avoid the embarrassment of such unusual fractions, and to facilitate the practical designing of this entablature, a small deviation in the, more or less, $\frac{1}{7}$ of a minute, may be allowed without losing claim to the symmetries of Vitruvius. Thus, the heights may be, the cymatium of the epistyles 5 minutes; the lower fascia of the epistyles $7\frac{1}{2}$ minutes; middle fascia $10\frac{1}{2}$; upper fascia 13; the freeze without it's cymatium 39, it's cymatium 6; denticules, cymatium excluded, $8\frac{1}{2}$, their cymatium 2; modillions 7, with cymatium of the scrolls, which should be sunk in the soffit of the corona; the corona $8\frac{1}{2}$ on the face, and it's cymatium 2; the sima $11\frac{1}{2}$. The sum of these heights is 120 minutes, equal to 2 diameters. And the 3 fascias and cymatium of the epistyles exactly 36 minutes, as before.

The projectures are, the lower fascia of the epistyles 25 minutes; middle fascia 26; upper fascia 27; cymatium 32. The face of the freeze 25; the cymatium of the freeze 31; face of the denticules $39\frac{1}{2}$, their cymatium $41\frac{1}{2}$; the modillion, to the extremity of it's scroll, the sally being 15 minutes, $56\frac{1}{2}$; the cymatium of the scroll 2 minutes high, and the sally equal and sunk in the soffit of the corona, it's projecture will be $58\frac{1}{2}$; and allowing $1\frac{1}{2}$ for the chin and drip of the corona, it's face will project 60 minutes, it's cymatium 62; the orlo of the sima $73\frac{1}{2}$, and the sally of the intine
cornice

cornice, from the face of the freeze, exceeds the intire height, inclusive of the cymatium of the freeze, by only $3\frac{1}{2}$ minutes : but if the modillion had the sally Perrault gives it, the excess would be $8\frac{1}{2}$.

It remains, to inform the practitioner, of the manner Vitruvius orders denticules to be cut, viz, the width of a denticule is to be $\frac{1}{2}$ it's height, which in the Ionic cornice is 11 minutes ; of course denticules in that, are to be $5\frac{1}{2}$ wide, and the metope, i. e. the space between them, he orders to be $\frac{2}{3}$ of the width of a denticule $= 3\frac{1}{3}$ minutes.—But in the Corinthian cornice, the height of denticules is $10\frac{1}{2}$, rejecting the fraction, let the width be 5 minutes, of which $\frac{2}{3}=3\frac{1}{3}$ for the space or metope.—It has been seen in the chapter of origins, that the bed, or aperture, left in the masonry for the reception of the end of a rafter, and for the end of a joist, was called, Vitruvius says, by the Greeks $\mu\epsilon\lambda\alpha\tau\eta$, and the space between, $\mu\epsilon\lambda\omega\tau\eta$: this latter term, evidently compounded of $\mu\epsilon\lambda\omega$ and $\tau\eta$, is, in the passage, where the cutting of the denticules is taught, written $\mu\epsilon\lambda\omega\tau\eta$, which appears to me, a manifest misnomer ; and no doubt the manuscript had, τ , but might appear to the copist, or to the printer, to be α . Commentators have expatiated at some length, to trace $\mu\epsilon\lambda\omega\tau\eta$ to an origin; De Laët says, in his M S. it is written $\mu\epsilon\lambda\alpha\tau\eta$: but in the chapter of origins, surely, all doubt of the orthography, or of the meaning of the term, is dispelled. And it is most manifest, both the space between 2 denticules, as well as that between two triglyphs, is to be called *metope*, from the Greek $\mu\epsilon\lambda\omega\tau\eta$.

The term, also, *cymatium*, so frequently used by Vitruvius, and it's meaning and origin so very certain and perspicuous, Perrault has contrived to immerse in ambiguity,

ambiguity, by attempting to explain the term, *Sima*, in the same sense. He tells us, Vitruvius wrote it here with *Si*, instead of *Cy*, to distinguish it from the little cymatium, over which it immediately stands ; and says, for the same reason he (Perrault) calls it la grande Simaise, and *that* under it, la petite Cymaise ! Now, to say nothing of the absurd contradiction in terms, of, a *Great little wave*, and of the ridiculous expression, a *Little little wave* ; in the next note, 73, Vitruve lib. 3 chap. 3 on the words, *ad summum coronæ cymatium*, he very confidently asserts, "Vitruvius means no other thing, than what just before he called *Sima*." Why then does not Vitruvius here write the word with *si*, and not depart so soon from the distinction he is said to have made, by here writing *cymatium* ?

Thus did Perrault embarrass and obscure a passage conveying documents of some interest, merely, one would conclude, through a gross inattention to the text : for I do maintain, the whole passage and every point of doctrine it comprizes, is as distinct, intelligible and perspicuous, as all the powers of language can render it. For, first, as to etymology, cymatium is acknowledged by all, to be derived from *Κυμα*, a wave, of which *Κυμαλιον* is the diminutive, which, written in latin characters, is, cymation, but spelled by Vitruvius, or his copists, cymatium, a *little wave*, it's profile, by a gentle curve, expressing such a form. But *Sima*, concerning the etymology whereof, Perrault himself has correctly stated the opinions of the learned, which renders his strange perversion of the term, the more surprising, must be allowed to mean, in the passage in question, flat-nosed; and, evidently, alludes to the lions faces, which Vitruvius informs us, were carved in this upper member over the
cymatium

cymatium of the corona ; one corresponding to each column beneath, along the side of the Temples, and perforated to discharge the rain collected in the gutters, with others made solid at regular intervals between them : and on account of this range of heads, which he calls capita leonina ; this member, thus crowded with the flat-noses, was nick-named *Simæ* from *Sima*. And, it must be observed, that in strict propriety, and in the mind of Vitruvius, the cornice, as the term itself implies, is completed by the corona with its own little wave ; for certainly cornice is derived from corona. But, the Roman architects perceiving the curved form, between the lions heads, became so enamoured of its beauty, as to retain that member without the heads, and adopted it as an integral of the cornice, under the appellation of cyma recta, and called the little wave cyma reversa, with this distinction, that the latter had the hollow under the round, the former above the round. And this assumption generally obtained in the Roman structures : and, no doubt, influenced Perrault's conceptions ; and what puzzled him, was, how to represent Vitruvius of his own opinion. And, after all, both he and his admired Romans, are obliged to omit this member in cornices under pediments, as it is always returned from the side cornice to the raking of the pediment ; in which situation, though not charged with the heads, yet the Greeks were so far from considering it a part of the cornice, or inventing a name for it, that they deemed it a mere accessory, and called the pieces of stone whereof it was composed, *ἐπιθήματα*, i. e. on-sets.

In reality this member is very beautiful, but all I contend is, Vitruvius used it not in the sense of cymatium, when situated above the cornice, where its size exceeds

exceeds other cymatia, as that belonging to the corona, at least six-fold. Moreover, from the use and end of cymatia, it is manifest, it could not there be called cymatium, which is used as a capping to principal members, and, by it's sally, to conceal the joint between one member and another; hence, Vitruvius sometimes calls it, *lysis*, signifying a visible joint; on which occasion the allusion is to it's use, as cymatium, alludes to it's figure and form. And the square, or broad fillet, on the top of the Doric epistyles concealing the joint of the freeze, might have been named *lysis*, though it were absurd to call it cymatium or little wave, on account of it's flat figure; therefore Vitruvius styled it, *Tænia*, a term expressive of the form as well as use.

Perrault complains, also, of the tenuity of the cymatium assigned by Vitruvius to the denticules and to the corona, being $\frac{1}{2}$ part only of their height, which, in the Roman antique, is generally $\frac{1}{3}$, and frequently more; and he might as well have complained, that men's hats are not half their stature high. His attachment to every thing the Roman architects practised, betrayed him into this erroneous decision; for a cymatium, $\frac{1}{3}$ of the height of the member it crowns, certainly becomes itself a principal, instead of appearing as it ought, to cap a principal member. Such injudicious symmetries, in the Roman antique, are justly to be complained of, as they produce an indistinct and heavy aspect in their cornices, and ought to be corrected by those of Vitruvius.

In concluding this section, I must animadvert on the absurd conduct of some moderns, who make the Ionic freeze in a circular profile, in form of the edge of a mattress; a barbarous device indeed, and founded in,

I must for once use the expression, the grossest ignorance. Vitruvius having called the Ionic capital *pulvinatum*, from the peculiar form of it's sides, where the leaves bound in the middle by a belt, resemble something of a pillow, must have given rise to the whim, so foreign from the mind of Vitruvius, and from common sense and reason.

Doric Entablature

It is rather remarkable, when Vitruvius enters upon the subject of the Doric style of architecture, he apparently neglected his doctrine of optics. He settles the height of the epistyles at 30 minutes, which is the lowest he assigned for the Ionic, in columns 12 feet high. But there are two considerations, which seem to account for his motive in leaving the epistyles in this low symmetry; one, that neither the freeze* nor any member of the cornice, are regulated here by the epistyles, as the Ionic and Corinthian were, but by the module, or semidiameter of the column, and divisions of it; and the other consideration which might influence him to fix only 30 minutes, was, that he had in contemplation Temples and other works on a small scale; as evidently appears from a passage in the sequel, wherein he provided an enlargement of the middle intercolumn, to accommodate the matrons who passed arm in arm, which in large columns, as in the Parthenon at Athens, is an unnecessary precaution. Vitruvius perceived, no doubt, the frequent preference given to the Doric style, in moderate Temples and structures; both on account of it's beauty, and much more, on account

* I beg the indulgence of Critics, for calling the collection of triglyphs and metopes by the name Freeze or Zophorus.

account of the facility of it's execution ; since in wood, a good joiner is competent to give it it's due forms and symmetries, even with dispatch ; and a mason well skilled in his art, can perform the same, when a correct design is put into their hands ; but the Corinthian and Ionic require the exertion of very accomplished carvers, to be superadded to the ingenuity of the former, and a much greater length of time, and almost a princely fortune to give this kind of perfection to magnificent structures. The Doric therefore, *then*, as well as *now*, was the prevailing style. And Vitruvius accommodated his epistyles to small columns. Yet, as before in the Ionic, I suspect his optical notions induced him to begin with that low symmetry of epistyle, the better to keep the increase within bounds, so here, to be consistent with himself, he has established only 30 minutes for this height, which I think is too low. But to proceed,

There are three styles, or fashions, of Doric entablatures ; one appropriate to the era of Pericles, of which the Parthenon at Athens is an instance ; another brought in by the later Athenians, and other Grecian states, and instanced by Vitruvius, as an improvement of the former ; and a third, is our modern deviation from both the others.

The character of the first differs even in it's capital, from the two last ; for it's abacus has no cymatium, and the three annulets altogether different, as before observed, in the Section on capitals. The epistyle about 40 minutes high. The freeze terminated at each end by a triglyph. The mutiles cut, as described in Vitruvius's chapter of origins, in a sloping direction ; and a mutile over every metope, as well as over the

triglyphs; the channels of the triglyphs, cut the whole height of the freeze, with a small part of the face left at top in a triangular form, with the sides of the triangles cut in the concave of a crescent, thus making the sides of the glyphs visible to the very top of the freeze, and producing an excellent effect, far superior to our modern way.

The character of the second style is that of Vitruvius, and varies from the first, by extending the angular intercolumn so much, as to cause the central line of the column, at the angle, to come exactly under the middle of the extreme triglyph of the freeze; and continuing the ornament of the metopes, or at least a part of it, beyond the extreme triglyph, to the extent of 15 minutes: for Vitruvius expressly says, the freeze from the last triglyph to the extremity, is to be half the breadth of a triglyph=15 minutes: therefore it must be the ornament, not the ground of the freeze that receives these 15 minutes, for it is an invariable rule, that the ground of the freeze must be in the same projecture, as the top of the column under the apothesis: of course, that being 25 minutes, the piece of the ground, beyond the angular triglyph, can be only 10 minutes. This explanation, I am certain, gives the sense of the text, and supersedes Perrault's comment on the passage.

The symmetries of this reformed Doric style, as taught by Vitruvius, is the object I have now in view. There is nothing in Grecian architecture, which has been so little understood, and so ill practised, as the disposition and symmetries of Vitruvius's Doric reform; which, though decidedly more convenient and sightly, than the ancient style of the Parthenon, would probably have been condemned, as an intolerable abuse, had it been

been submitted to the decision of the celebrated Her-
 mogenes, who, long before, gave up his design of build-
 ing a Temple, as he had intended, in the Doric style,
 rather than take any liberty with the established sym-
 metry and disposition of the freeze; and who, with
 Tarchesius and Pythius, judged the Doric style, though
 of acknowledged excellence and grandeur, not suitable
 to the disposition of Temples, as Vitruvius informs us,
 on account of the contraction, the freeze occasioned, of
 the extreme intercolumns : and, in fact, this blemish
only is rectified by the reform, and that by the admission
 of another ; viz, the fragment of a metope, at the ends
 of the freeze, which might, perhaps, have appeared as
 disgusting to the ancient Greeks, as the unequal inter-
 columns did to their successors. Now in executing a
 freeze in the reformed style ; It appears to me, that the
 kind of ornament, with which the metopes are decorat-
 ed, should be some device of about 9 minutes wide, and
 equal to the freeze in height ; 3 such placed in every
 metope, with 4 minutes interval between the middle
 one and the extreme ones, and 5 minutes between the
 extreme ones and the triglyph, right and left of these
 ornaments : and 3 devices and the spaces would engage
 the 45 minutes of the metope's breadth ; and one of
 such devices, placed at the angle of the freeze, 5 minutes
 also from the triglyph, and it's own width one minute
 more, than the others, would answer the symmetry
 assigned to the fragment, and would much contribute
 to obviate the vicious appearance of a mutilated metope;
 because such forms of ornaments could be mitred at
 the very angle of the freeze, as the triglyphs did, in the
 ancient freeze ; which proves, they were 5 minutes
 in thickness, if the ground of the freeze was in 25 pro-
 jectures.

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ved form: in place of the cymatium of the epistyles, there is the Tænia, which means an extended fillet similar, on it's face, to tape, with it's edge square and sharp: in the freeze the edges of the channels of the triglyphs, are angular, and their perfection consists in being true and sharp: over these, and in place of the cymatium of the freeze, comes an extended flat and angular-edged member, like the tænia, and, purely for distinction, called the capital of the triglyphs. On this member, stands the corona with it's appendages, viz, the mutiles, so named in the chapter of origins; but here ascertained, by Vitruvius, through a description of it's figure, situation, extent and sally: that it is made up, he describes, of six guttæ, or pendant drops, in it's front, and three in it's flank, not touching one another, but cut with passages between them: all this clearly expressed by "*viarum directiones et guttarum dispositiones*;" and these sets, of 18 drops, are not in contact, but parted by intervals of $7\frac{1}{2}$ minutes, as the sets over the metopes, being, as the others are, only 30 minutes in front, hang over only 30 minutes, in the middle part of the metope, which is 45 minutes wide. All this must be perfectly intelligible to a professed architect.

Now Vitruvius says, these guttæ, evidently what before he denominated mutile, are to be cut out, in the soffit of the corona, for which purpose he assigns 15 minutes to the thickness of the block of marble, out of which the corona and these mutiles are to be wrought. And since there can be no reason to give the face of the corona, here, a greater height, than it has in the Ionic, viz, 11 minutes including its *proper* cymatium at top, this will occasion the drops to be seen 4 minutes, in front, lower than the chin of the corona, which chin, called

called by our workmen the drip, is to be cut into it's soffit, by a line* called scotia, says Vitruvius, with allusion to it's effect, the term scotia signifying a shade or darkness, as the hollow within the chin produces that shade.

As, then, Vitruvius duly gave every principal, and every subordinate, distinct member, it's proper termination at top, by assigning it a cymatium, when he treated of the Ionic style; it is repugnant to architectural propriety to imagine, he intended nothing of that kind, as a crowning to these mutiles; and, since he could not properly call such a crowning of them a cymatium, a term which he could not apply to epistyles and to the freeze, on account of the flat and angular form, such crownings there have, instead of cymatia; hence it was, he gave to this capping of the sets of drops, the name *Doricum* cymatium; since *tænia* was before the term engaged for the epistyles, and this obliged him to distinguish the very same formed member, by the name, capital of the triglyphs, when it was in place of the cymatium of the freeze: neither of these names, therefore, could he use for the capping of the drops, without causing a confusion in terms, and accordingly distinguished it from a cymatium, *properly* so called, by the adjunct *Doricum*; saying, "corona habens cymatium *doricum* in imo alterum in summo." It is evident, by the word *alterum* he means the cymatium *properly* so called, for the capping of the face of the corona. This is the whole mystery of this passage; which so perplexed the learned commentators, who by their conjectures and researches gave a kind of importance to a trifle,

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which

* By *line*, here, he means profile,

which is nothing more, than a small fillet, in place of a cymatium, over the sets of drops, cut out of the thickness of the soffit of the corona, a minute or two from the scotia of the chin, and completed the mutile. Perrault was so far from understanding this passage, that he accused Vitruvius of having neglected the mutile, in his description of the Doric entablature, after he had named it, in his chapter of origins.

But, continues Vitruvius, "in the systylon and monotriglyphon work, on every epistyle are to be placed both two metopes and two triglyphs, but the angular ones, more than this, a duple quantity as much as half a triglyph." The words in the text are, "*supra singula epistylia et metopæ duæ et triglyphi bini erunt collocandi, in angularibus hoc amplius, dimidiatum quantum est spatium hemitriglyphi.*" The ancient grammarians had a subtle distinction between *dimidium* and *dimidiatum*, which I pretend not to penetrate, and am ready to submit to the decision of the learned; but as to the meaning of Vitruvius, whether he wrote those precise words or not, it is impossible to be mistaken, when the previous words, which are perfectly intelligible, are but duly attended to. Epistyles, I have before observed, are things as numerically distinct, as capitals of columns, which support them; for in stone work (here supposed) the portions of stone, which reposed on the capitals, had their joints exactly on the middles of the capitals: each stone evidently reposed in two columns, hence called epistyle; and when the distances, from the centre of one column to the centre of another, are equal, of course the stones, or epistyles, will be all of a length: then it is again evident in monotriglyphon work, wherein one triglyph only is over the
intercolumn

intercolumn, the two ends of each epistyle must come right under the middles of the two triglyphs, which stand over the columns in the freeze ; of course over each epistyle, there will be a whole triglyph, and over each of the ends of the said epistyle, half a triglyph; and two halves equal one, which, with the one in the middle, are equal two triglyphs, causing also two metopes ; and this is what Vitruvius says, "*supra singula et metopæ duæ et triglyphi bini.*" And again it is evident, if the epistyle, that reposes on the angular column and on that next to it, is only the same in length, with the others, it would finish on the centre of the angular column, and under the middle of the angular triglyph, and, if so to remain, there would be required another piece of stone, equal to the space of half a triglyph; and the space from the triglyph to the extremity of the freeze, equal to another half triglyph ; therefore did Vitruvius order the angular epistyles, right and left of the Temple, to be longer, to supply this deficiency, as a piece of a stone, at the angle, would be extremely ill masonry. All this being demonstration, or rather evident, it requires no further comment.

Perrault censures Vitruvius for writing systylon, which, as a species of intercolumns, means 2 diameters ; and not rather pycnostylon, which implies $1\frac{1}{2}$ diameter. Though his criticism is not unfounded, yet he had as good reason to extend it to what Vitruvius before called diastylon work ; for as monotriglyphon, which requires exactly $1\frac{1}{2}$ diameter for the intercolumn, cannot properly be the species systyle, so neither can ditriglyphon, which takes up only $2\frac{1}{2}$ diameters, be properly called diastyle, which imports the species of intercolumn of 3 diameters. But it appears, Vitruvius used these terms,

this Doric style, not in the strict sense they have, as species, but in their generical sense; in which, systylon only means, columns very close, and Diastylon, columns far asunder.

Perrault, again, notwithstanding the perspicuity of the above passage, took upon him to correct the text, from *supra singula epistylia*, to, *supra singula intercolumnia*: by which he has obscured and thrown the whole passage into confusion. Not permitting, it should seem, the liberty to Vitruvius, to explain this second description by a method different from that he before used. And he defends this correction, in a way curiously absurd, saying, for it is not true, that each epistyle has over it only *one* triglyph and two metopes, (as if Vitruvius had said one,) for the half triglyphs at the ends with that in the middle, make two triglyphs and two metopes."—Here he relates the very words of Vitruvius and the true document, and yet perceived not the folly of his own correction.

"But the middle epistyle, continues Vitruvius, is to have three metopes and three triglyphs, to enlarge the access."

Perrault, conformably to his ridiculous correction, takes this for three triglyphs over the intercolumn, instead of over the epistyle, the same symmetrical length as in the diastyle ditriglyphon; not perceiving, or not attending to the disproportion, such a perversion of the true document occasions between the middle intercolumns of 4 diameters, and the others, here of only $1\frac{1}{2}$ diameter; while in the ditriglyphon, it is 4, to two and three quarters. And in this degrading proportion has he given us his explanatory designs, in his plate xxvii.

All the rest of this second passage, in Vitruvius, is the same as in the ditriglyphon, relating to the corona &c. And it appears, by his ordering the middle epistyle, in ditriglyphon, to have the addition of a triglyph and metope, more than the others, that he had in contemplation Temples on so very small a scale, as to render it practicable to form the middle epistyle and the part of the freeze over it, in one stone: since he elsewhere teaches, that epistyles of stone or marble, are, even in diastyle, scarcely admissible, on account of the danger of breaking; how much less admissible in areostyle, where the intercolumn, in question, is of 4 diameters; and which he assigns to the central intercolumn in ditriglyphon work. And, since he gives to this monotriglyphon a central intercolumn equal to the side intercolumns of the ditriglyphon, why should not that have been sufficient for the central one, in the former, unless, because it was on a much smaller scale? Columns of 2 feet diameter would, in areostyle, produce but 8 feet for this central intercolumn which is not more than requisite for 2 to pass a-breast: but if 4 feet diameter, certainly diastyle or systyle would be sufficient.

Vitruvius tells us his reform of the ancient Doric style, obviates all defects, in arranging intercolumna, triglyphs, and metopes in the freeze, and also mutiles in the soffit of the corona; now the capital of the triglyphs cannot project less than 31 minutes, to which when we add 20, the sally of the corona, we have a projecture of 51; then, from the side of the mutile over the extreme triglyph, to the capital of the triglyphs, on the flank of the work, we have 16 minutes; add this to 20 and we have 31 minutes to be disposed of amongst the drops of
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the angular mutile, and the space between those drops and the mutile over the extreme triglyph in front ; taking then from the 31, $7\frac{1}{2}$, and there remains $23\frac{1}{2}$; from this, something must be deducted, for the chin of the corona and scotia, suppose $3\frac{1}{2}$; there rest, then, only 20 minutes for the angular drops, instead of 30, which they occupy in the other mutiles : and only four drops can appear in front and flank of the angular mutiles, instead of six. This is some imperfection, and our master's assertion was rather premature.

In the Parthenon, where the extreme triglyph is at the very angle of the freeze, there was no necessity of a space of $7\frac{1}{2}$ minutes ; for the back part of the front mutile meeting the back part of the side mutile, on the flank of the Temple, in the very angle, caused a square in the soffit of the corona, about 16 minutes each side, which the architect filled with an ornament resembling the honeysuckle. Probably, Vitruvius intended some such device in his reform.

The modern disposition of this entablature, is sufficiently understood, as there are numberless little publications that exhibit all it's varieties, some have only 18 drops in the mutiles, others with Perrault 36. All omit the mutiles over the metopes ; and are not agreed as to the height of the mutile ; Perrault has a broad fascia in the front of the drops, which has the worst possible effect, and is the most injudicious of any thing of his own designing. The theatre of Marcellus at Rome is what the moderns take their ideas from.

If Vitruvius's reform is adopted, and 13 minutes given to the height of the Simæ, and 12 minutes added to his height of epistyle, the entablature will be 2 diameters high ; and the channels of the triglyphs cut as
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in the Parthienon, then will this entablature be far preferable to any of the modern variations.

SECT. IX.

Of Pediments.

THIS term, *pediment*, is of modern institution, and appears to have been suggested by the use generally made of it, viz, a footing for statues; derived from *pes* a foot. The Greeks and Romans raised pediments only on the fronts and posterns of their Temples, as such structures alone had pitched roofs. Vitruvius denominates it *tympanum*, which signifies a pannel, in architecture; at other times it is taken for what we call a drum; hence some writers have rendered *tympanum*, the drum of the pediment, and betray, by such a translation, a very confined knowledge of Vitruvius. The enclosing of this plain triangular flat, always to be in the same perpendicular, with the ground of the freeze of the cornice, by the sloping, transferred cornice on the sides, and by the straight cornice at bottom, gives it the true resemblance of the pannel in a large door, which is framed by the styles and rails; and such pannels are called by Vitruvius *tympaña*, the styles *scapi*, and the rails *impagines*: with this difference, that, in doors, they have four angles.

The *tympanum*, or pannel, is of a triangular form, the height of it's perpendicular, of course, determines it's three angles, when the length of it's base is known. And as the cornice over the freeze beneath, must be transferred to the acclining sides of this pannel, exactly in such form and height, as it stands in, over the freeze; it follows, that the angles of the pannel, determine the pitch of the finished pediment. The

The rules and method for adjusting the height and base of this triangular pannel, are stated by Vitruvius, in his book 3, chap. 3, for Grecian Temples; viz, the front line of the corona of the cornice, taken at the extremities of it's cymatium, is to be divided into nine parts, and one of these parts is to be the height of the perpendicular of the pannel; then, having fixed a point at that height, and continued the central line upwards at discretion; the exact height of the cornice beneath, or as many members of it as are intended to accompany the corona, taken in the compasses; and the fixed leg set in the point at top of the pannel; two arches are to be scribed, one on the right and the other on the left of the central line, with their convex sides upwards; a line is then to be drawn, from the extremity of the fillet of the corona, to the central line, touching the arch as it passes; and this repeated at the other side; the raking line of the pediment's corona is then determined. Next are to be scribed arches, right and left, with the same opening of the compasses; and the fixed leg on the raking line, before drawn, and as near, as convenient, to the bottom; other two arches are to be scribed, and lines drawn from the aforesaid vertical point of the pannel, touching the arches as they pass. Thus will the angles of the triangular pannel be ascertained, and, when the members of the cornice are transferred, and drawn between the raking parallel lines, the pediment will be completed.

This rule, however, is vague; for the angles, ascertained by any given height of cornice, and a given number of columns, suppose 4, and at 2 diameters distant from each other, will be different in any other height of cornice, and, in the *same height* of cornice,
over

over 8, or any other number of columns : for though $\frac{1}{2}$ part of this longer line, is in the same ratio to the line itself, as the $\frac{1}{2}$ part of the shorter line was to that line ; yet the angles were not ascertained by that ratio, but by the approach of the bottom of the under parrallel line, to the foot of the perpendicular of the triangle : therefore, to preserve the ratio, and to produce the same angles, the proportion must be, as the $\frac{1}{2}$ part, or perpendicular of the triangle over 4 columns is to the height of that cornice, so is the perpendicular of the triangle over 8 columns, to some other height of cornice. But, since an increased height of cornice over columns of the same size, is neither admissible nor intended by Vitruvius ; therefore, his rule is vague. But it does not follow, that Vitruvius was not apprised of this effect of his rule : on the contrary, there is reason to conclude, both he and the Grecian architects, intended octastyles and decastyles to have pediments in a lower symmetry than tetrastyles, as the great increase of the absolute height of the former, rendered a pitch somewhat lower, more eligible. In a tetrastyle, in systyle, the angle at the spring of the pediment, by the rule, will be about 18° ; and, with the same height of cornice in an octastyle, systyle, the angle at the spring, will be found about 15° ; and this will cause a very material difference in the pitch, or angle at the ridge, of the pediment. The tetrastyle being no flatter, than 144° , while the pitch of the octastyle is as flat, as 150° . And, in the Parthenon, at Athens, the pitch is still lower, being about 156° , as the angle at the spring is about 12° .—From these variations the practitioner may make his choice ; and if, biassed by modern usage, he may deem a pitch even of 144° , too low ; he will find,

in the next section, a pitch authorized by Vitruvius, somewhat higher : which, I think might well be established for all pediments universally.

Upon the raking corona is to be placed the moulding called *cyma recta* by the Italians ; by Vitruvius, *Simæ* ; strangely explained by Perrault, as exposed above in last Section p. 238 : and by the Greeks, *αὐλῆς*, i. e. on-set, or coping. This *cyma recta*, though very beautiful, is not a constituent of a cornice, as before observed, for if it was, it could not be omitted in the front cornice under the pediment ; when it has place on the side cornice, it returns over the raking corona, and mingles in the angle of the corona beneath, by ordinates transferred from that on the side, to that placed on the raking corona, where by this method, it does not project equal to it's height, in which the perfection of this moulding, in particular, consists ; it would be better, therefore, when the pediment front is the most conspicuous and principal elevation of a structure, to give this moulding it's due height and projecture over the pediment, and transfer it to the side one, which had better be seen in a sally, a small matter, too much, than that on the pediment too little.

On this last moulding, which is in fact the coping of the pediment, are usually placed blocks of stone, with soles or bases cut to the raking, and the sides of the blocks perpendicular, and at top have a corona with it's cymatium, and sometimes only a cymatium ; one of these blocks called by Vitruvius *acroteria*, stands right over the angular column, right and left, and in front and flank in the same perpendicular, as the ground of the freeze of the entablature ; and in height, half the height of the pannel ; but a third *acroter* is to stand on the
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the ridge, an eighth part higher than the angular. Thus Vitruvius.

I cannot believe Vitruvius intended the height of angular acroters to be half the height of the pannel, in any number of columns, as the words seem to import; for there can be no reason assigned, why they should be so much more in absolute height in a decastyle front, than in an hexastyle, or tetrastyle; in this last, by the rule, the height is 35 minutes; but in a decastyle of columns of the same size, the height, by the rule, will be 96 minutes; supposing both to be systyle, and the Sally of the corona 30 minutes, in both examples. Now 96 appears to be too low, because the statue, which is to stand in the perpendicular central line of the column, and the acroter, will not have, at top, as much extent to the side next to the centre of the pediment, as on the other side; the statue therefore would stand on the inward extremity of the acroter, or else out of the centre of the column. A good medium would be, one diameter for the height of the angular acroters in all cases, and for the three acroters, since it appears Vitruvius ordered the middle acroter, on account of it's greater elevation, to have an eighth more of height to consult his, now exploded, optics.



SECT. X.

Of Tuscan Architecture.

IN this section I shall only treat of the Tuscan style, considered independently of the Temples, as I shall treat of Temples in the last chapter. Vitruvius assigns to the symmetrical height of the column 7 diameters; and to the contraction of the top of the shaft,

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under the apothesis, $\frac{2}{3}$ of a diameter=45 minutes ; the projecture, of course, only 22 $\frac{1}{2}$ minutes.

The Tuscan base, Vitruvius makes $\frac{2}{3}$ a diameter high, the plinth $\frac{1}{3}$ it's height=15 minutes, and orders it to be circular : the torus on the plinth, including the apophyge, is to have the other $\frac{1}{3}$ of the intire height also=15 minutes.—Perrault, and all commentators whom I have met with, conceived, the apophyge, here, to mean the cincture round the bottom of the shaft, which in the attic and Ionic bases stands on the upper torus, without being included in their 30 minutes of height. Now this cincture, both here, and in the other bases, Perrault makes 3 minutes high, and erroneously takes it for the apophyge : Vitruvius says nothing concerning this cincture, or it's height, but very expressly orders the apophyge to be taken out of the upper 15 minutes. I have before discussed the subject of the apophyge and it's cincture, in Section 5, on bases ; and here pursuantly maintain, Vitruvius intended, not the cincture alone, which has no allusion whatever to the thing signified by apophyge, to which 4 minutes may safely be assigned, and one minute only to the cinctures ; for reasons stated in Section 5 : these 5 minutes taken into the height assigned to the base, cause the height of the torus to be 10 minutes ; and taking the centre, on which to scribe it's semicircular profile, directly under the projecture of the cincture of the apophyge, and that being 34 minutes, the projecture of the torus will be 39 minutes : which is perfectly conformable with that, which the capital has. The capital is composed of an abacus, called by Vitruvius the plinth of the capital, alluding to it's form, as abacus alludes to it's use and situation ; and in both, it is exactly the
same

same as that on the Doric capital, where it generally had a cymatium ; though in the Doric capital of the Parthenon, there is nothing for a capping over this plinth. The other constituents are, an echinos, and an apophyge with the hypotrachlion, or neck. The height of this capital, as in the Doric, half a diameter, which is to be divided into three : 10 minutes to the plinth, 10 to the echinos, and 10 to the neck with the apophyge. The projectures are ; the plinth 30, the neck $22\frac{1}{2}$; of course, the sally of the plinth from the contraction of the top of the shaft, is exactly the same, as in the Doric ; where the similar plinth projecting $32\frac{1}{2}$, and the neck 25, is in the very same sally. This is a convincing argument against Alberti and Perrault, who imagined the $32\frac{1}{2}$ minutes assigned by Vitruvius, to the projecture of the Doric capital, were intended to include it's cymatium. See above, Section 7.

On the capitals of columns, instead of epistyles, there are what Vitruvius calls, *Trabeæ compactiles*, and in English, I conceive, may be termed, *connected beams* : but the question is, what we are to understand by this term, *compactiles*, or, *connected*. This we learn, at least, with certainty from Vitruvius ; the method of performing the thing intended, is by what he calls *subscus* and *securicla*, which mean what our workmen call *dove-tailing* : *subscus* I take to mean the swallow or dove-tail itself ; and *securicla*, the counter part cut in the butt, or end of a board or beam, to receive the dove-tail form, which is cut in the butt, or end of another board or beam.

This much premised, we come next to the application of these to the trabeæ or beams on these Tuscan columns ; which, in that style of disposition, were only
four

four in front, but so far asunder as to render stone epistyles intirely out of the question. Therefore timber was had recourse to. The three beams, then, which reposed on the four columns, Vitruvius says, are to be cut or hewn to such a scantling, as our workmen call it, as the symmetry of the work requires; viz, the under side equal to the upper part of the column, = 45 minutes, and of the symmetrical height Vitruvius very prudently said nothing; well aware, it is to be regulated by the quality of the timber; for whatever the bearings are in the clear, it is certain the strength of the timber consists much more in it's depth, than in it's breadth, hence, these timber epistyles must be higher, than the stone ones in Doric and Ionic work. But, Vitruvius gives this caution, that, in connecting their ends, over each of the middle columns, by the swallow, or dove-tails, a space of two fingers be left between the ends of the beams so connected; for, says he, if they are drawn tight together, so as to exclude the air, their ends will very soon heat and rot.—This passage, however, is very differently explained by Perrault, and some others; who conceived Vitruvius to mean, that these timbers were not to be in one intire beam, but in separate planks, laid side to side, with two fingers breadth between, secured, in that position, by the dove-tails. Now the good sense of such an explanation, I have not light enough to discern. But, I am bold to say, Vitruvius understood the management of timber better, than to teach such an inconsistent disposition. The truth is, both Perrault, and his great admirer Felibien, with the whole race of French carpenters, since their time, were and still are, two or three centuries behind us in the art of carpentry. And I have in my possession the design of

a roof for a span of 24 feet, drawn under the direction and approbation of Mons. Durand, superintendant of the French King's works, in Flanders, about 40 years back, which will fully bear me out, in what I have here advanced.

But to return ; Vitruvius, after giving this caution not to lay the *butts* of the beams in contact, lest the humidity easily imbibed by the grain of timber at the but-ends, should heat and decay ; says, "*supra trabes et supra parietes trajecturæ mutilorum parte quarta altitudinis columnæ projiciantur.*" In English, "the mutiles passing over the beams and over the walls, are to sally forth a quarter of the height of the column." i. e. $1\frac{1}{4}$ diameter. Inigo Jones has exemplified these kinds of mutiles in the portico of St. Paul's co-vent garden. But, Perrault could not prevail on himself to believe what he acknowledged to be the import of the reading ; and, without correcting the text, as usual, contented himself with saying, it was very obscure : he then proceeds to state what he imagined ought to be understood : i. e, upright pieces of timber, $1\frac{1}{4}$ diameter high, erected on each column, and the beams, with masonry over them, bearing on the capitals as far as these uprights permitted, and filled up between them. But, concludes his note very modestly, saying, he pretends not this as an explanation of the passage, but as merely an enigma. Yet, sets forth his version of the text, and also his design in his plate, pursuant to this whimsical scheme, duly calculated to puzzle ; and his above method of dove-tailing is another enigma.

It does not appear, from the words of the text, that masonry was laid on the epistyle-beams, as Perrault took for granted ; the walls belong to the side of the Temple, as will be shewn in the next chapter on Temples,

bles, and ranged with the two side columns, right and left of the Temple ; and the mutiles project over the beams, and over the side walls, equally. I have before observed, Vitruvius left the height of the epistyle-beams undetermined ; only the soffit he orders to be 45 minutes : and certainly the height must be more than the breadth, but how much higher, depends on the size of the tree, out of which these beams are procured : 30 minutes on the side of the beam may be set off for the height of the epistyles, and the remainder of the height left to form a freeze ; on which the mutiles repose and project $1\frac{1}{2}$ diameter from it.

And to the ends of the mutiles are to be affixed, says Vitruvius, a corona with it's cymatium, of wood, called by him, antepagmentum. Over these (mutiles) comes the pannel of the pediment either of timber, or of masonry ; of course in the same perpendicular with the freeze beneath. Then, continues Vitruvius, the king posts, principals, and purlins, over the pannel, are to be so adjusted, as to cause the height of the pediment to answer to $\frac{1}{3}$ of the run of the finished roof. The words of the text are, " ut stillicidium tecti absoluti tertiaro respondeat." As neither the height of the corona called antepagmentum, nor the projecture of it's cymatium, are determined by Vitruvius, he took not a ninth of it's length for the height of the tympanum or pannel, as in the Ionic style, but orders the pitch of the pediment to be determined by another rule : which is, by what our workmen call the run of the roof, always alluding to the lead, slates, or tiles, with which it is covered, and the run is taken from the ridge to the eaves : this is what Vitruvius signifies by stillicidium, and by tectum absolutum he means the outside of a
finished

finished roof; and *tertiarium*, here, can have no other signification, than a third. It is, then, evident that the ridge and the eaves, right and left, with the horizontal line, from the eaves on one side, to the eaves on the other, form a triangle: and, when the perpendicular of any triangle of equal sides, is a third of the length of a side, the angle at the spring will be 20° , as taken by a protractor. And as, before, Vitruvius gave a rule for the Ionic pediment, which produced between 18° and 19° , that is a sufficient proof of the 20° here, being what he intended.

The wild manner in which Perrault has translated the text in this passage, and the strange comment he has on it, in his note 10, on the chap. 7, book 4, is altogether astonishing. In his version, he has, "du fronton qui doit estre fort eleve" i. e. "the pediment which ought to be very high." Not a word is there in the text of such an import: yet he has both inserted this in the version, and designed a roof in his plate xxxii, $\frac{1}{2}$ part of the perpendicular too high, and yet this is considerably lower than his Tuscan pediment, in his plate viii book 3, where the pitch is, indeed, enormous: and by this variation, it is proved, he had not sufficiently studied Vitruvius, and had no settled principle for a rule. In his note, he tells us Laet, in his amplification of Baldus's Dictionary of terms, says *tertiarium* signifies the fronton or pediment itself: this only proves, if Perrault has not misrepresented him, that his publication is truly contemptible. And the sequel of the note is uninteresting, and foreign from the sense of the text.

I must observe, in concluding Vitruvius's canon of symmetries, Perrault and most of the moderns have,

very erroneously, concluded that the Tuscan column was intended to be in a more masculine symmetry, than the Doric : whereas it is evident, by the symmetry assigned by Vitruvius, it was intended, by him, to be more delicate. And, the true reason, also, that the upper part of the shaft has only 45 minutes diameter, is, that the soffit of the timber beams, which are the epistyles, might be narrower, than in the Doric. It was the prevalence of the ridiculous notion of the *five orders*, which betrayed so many of the moderns into the mistake of the Tuscan style, as the first in *their* series, being the most massive : while it is treated of, in the last place, we find, by Vitruvius.

CHAPTER XIII.

OF TEMPLES.

The two most celebrated Temples that ever were on earth, considered for magnificence, grandeur, beauty and elegance, were the Temple of Solomon at Jerusalem, and the Temple of Diana at Ephesus : both which I have already described in the foregoing part of this work. Some of the Egyptian Temples, indeed, have exceeded these in amplitude, according to Dendera's account of them ; but in design and execution, I may venture to affirm, none of them were comparable to the Jerusalem, and Ephesian Temples.

The boundaries of this publication restrain me from expatiating on some other designs of Temples, to that extent, to which my inclination prompts me. I must confine my discussion chiefly to the Olympian, and Parthenon Temples at Athens, which are set forth
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by Mr. Stuart, in his truly valuable work, the *Antiquities of Athens*. This, I propose to do, not as a plagiarist by representing his descriptions as my own, but by pointing out certain discordances between his designs and the letter press, that refer to them; and by combating some of his opinions. This, I shall have occasion presently to engage in, from the description given by Vitruvius of Tuscan angular Temples; the symmetries of which I have just concluded, in last section, last chap.

Vitruvius, book 4, chap. 7, says, "The site, or ground for the (Tuscan) Temple is to be, lengthwise, divided into 6 parts, whereof 5 are for the width of the Temple. Again, the length is to be parted in the middle, the postern $\frac{1}{2}$ for the 3 cells, the front $\frac{1}{2}$ to be laid out in columns. Then the postern $\frac{1}{2}$ is to be divided, breadthwise, into 10 parts; 3 to each lesser cell, and 4 to the middle cell, (which he calls *sedes*.) The space in the pronaos, before the cells, is to be so disposed of, amongst the columns, as to have the angular columns opposite to the *antæ* of the outer walls of the lesser cells; and the two columns in front, between the angular ones, are to be opposite to the two *antæ* of the walls of the middle cell (or *sedes*.) And these columns so disposed, as to have others in the middle between them and the *antæ* of the four walls, respectively." He then gives the symmetry of the column, it's height $\frac{1}{4}$ part of the width of the Temple, and it's other symmetries, as I have related in last sect. last chap.—The pronaos of this Temple we see had 8 columns, 4 in front, and 4 between them and the 4 ends of the walls, which separated the cells. This is Vitruvius's first description of a Tuscan angular Temple. Then, after describ-

ing Tuscan Rotundas, which for the present I shall supersede, he gives variations of Tuscan angular Temples, "of the same symmetries, but of different dispositions, exemplified, he tells us, in the Temple of Castor in the circus of Flaminius, in that of Jupiter avenger, and more precisely in that of Minerva, by *adding* the columns at the shoulders of the pronaos right and left." The meaning of this passage is, that in ordaining these Temples, the architect, after disposing 4 columns in front, (as Vitruvius orders, in the first description,) omitted the 2 columns, which, in the other plan, stand between the 2 middle front columns, and the 2 antæ of the walls of the middle cell; and only added the other 2 columns at the shoulders of the pronaos, which stand, one on the right hand, and one on the left, between the angular column and the antæ of the outer wall of the little cell. And the pronaos being open on the two sides, as well as on the front, Vitruvius, for distinction, called the sides, right and left, the shoulders of the pronaos. The variation then, consists in this, that the external columns, only, are herein retained, 6 in number, and the area of the pronaos, left clear. Then Vitruvius continues "Hoc autem genere primo facta ædes, uti est Castoris in circo, Athenis in arce Minervæ, et in Attica Sunio Palladis. Earum non aliæ sed eædem sunt proportiones. Cellæ enim longitudines duplices sunt ad latitudines, et uti reliqua exisona, quæ solent esse in frontibus, ad latera sunt translata."

In English, "In this manner, like the castor in the circus, was a Temple at first erected to Minerva in the fortress at Athens, and to Pallas at Sunium in Attica : the proportions in nothing different : for the cells are
twice

twice their width in length,* and all other things customary in fronts are equally transferred to the sides." This I maintain to be the true sense of the text; let critics amuse themselves, as they please, with the term *exisona*, which some affirm is no where else to be found. But what then? we know it is made up of the Greek word, ἴσος, equal, or even, and, ἐξ, and there can be no doubt of Vitruvius's meaning.

This kind of Temple, then, he tells us, was at first dedicated to Minerva in the acropolis at Athens.

And the remains of the Minerva Polias delineated by Mr. Stuart, and to be seen in his plate 3, chap. 2, vol. 2, are, as to the open pronaos, exactly disposed in the manner Vitruvius describes this variation: so that it is most evident he alludes to that Temple, either in the state, in which it was previously to the Persian conflagration, or in it's restored disposition, in which Mr. Stuart found it's remains: the pronaos is perfect with it's 4 columns in front, and one at each shoulder; but only a part of the area of the cells remain, which portion of the area, together with the area of the equally ruined cells of the Pandrosium, are thrown into one, and are situated at the back of the cells of the Neptune called Erectheum; and the side walls of this Erectheum are continued on to the west, as far as the western extremity of the pronaos of the Pandrosium, from which point to the open pronaos of the Minerva Polias, a western wall is erected, the end of which is nearly opposite to the third of the front columns of the pronaos

* Twice their width &c. he means nearly, sufficiently to distinguish them from the cells of Grecian Temples, which were almost square.

protrusion of the Polias, whereof the western shoulder runs out, to westward, beyond this western wall, exhibiting a very awkward appearance. And, from the modern work in this said western wall, it is evident, it has been erected a very few centuries back. The front of the Erechtheum is to the east, and is a regular hexastyle. These three contiguous Temples, had, no-doubt, at first their appropriate cells; and I have designed them all according to Vitruvius's documents, and found the enclosed vacancy,* behind the proper cell of the Erechtheum, exactly equal to the three cells of the Pandrosium, and also the due length for the cells of the Minerva Polias, which, doubtless, at first, had it's third little cell to the west, now cut off by the modern wall.

I have given the above verbal description of the Minerva Polias at some length, that the reader may, by collating it with what I have attentively transcribed from Vitruvius's, chap. 7, book 4, see, with what reason we may be surprized, when we read, in Mr. Stuart, chap. 1, vol. 11, page 6, the exact transcript of Vitruvius on a variation of a *Tuscan* Temple, almost, the identical same as the remains of the restored Minerva Polias, nicely delineated by Mr. Stuart himself, in his plate of the Acropolis, and subsequent plates; and yet find, he has, in the following passage, not only perverted the Polias to the Parthenon, but also cited the description of Vitruvius, professedly confined to *Tuscan* Temples, as indicative of a peculiar disposition in Grecian Temples, and applicable, in particular, to the Minerva Parthenon: treating of which, in this his chap. 1, vol. 2
after

* I have assumed the vacancy, as it appears in Mr. Stuart's Plate.

after stating his arguments, and very conclusively, to prove, from the documents of Vitruvius collated with the reports of Wheeler and Spon, that the Parthenon was an hypethros, he thus continues, "another objection may be deduced from what Vitruvius himself has said (book 4, chap. 7,) where, enumerating several deviations from the usual form of Temples, he (Vitruvius) tells us, *Temples are also built of other kinds, ordered with the same proportions, but differently disposed, as that of Castor in the circus of Flaminius, and that of Vejovis between the two groves; also, but more ingeniously, that of Diana Nemorensis, with columns added to the right and left on the shoulders of the pronaos; but this kind of Temple, like that of Castor in the circus, was first erected, in the fortress of Athens to Minerva.*" So far Mr. Stuart.

Now this variation of the first Tuscan Temple, described by Vitruvius, who says it was at first, *primo*, erected to Minerva, Mr. Stuart has mistook for the Grecian Temple of Minerva Parthenon. And, in confirmation of this charge, he, again, in his explanation of plate 2, calls the hexastyle *portico* of the Parthenon, its *pronaos*; and says, "in this the disposition of the columns may help us to explain an obscure passage of Vitruvius, where, speaking of some deviations from the usual manner of constructing of Temples" (the reader has seen these were Tuscan Temples,) "he informs, that columns were sometimes added to the right and left on the shoulders of the pronaos;" (but this happens to be a regular hexastyle portico, and no addition whatever between the angular column, and the angular anta of the wall.) He continues, "and that this addition, of which he instances some examples, was first practised at Athens, in the Temple of Minerva." (true, and as he himself

himself has afterwards delineated, in the open promado; of the Minerva Polias.) Vitruvius no more assimilates the deviation here in question to the Parthenon, than to the Pantheon at Rome; and whoever will peruse the 7 chap. 4 book, will find it wholly apertains to Tuscan Temples.

As to Mr. Stuart's correction of the term, *exisond*; it is very similar to some of Perrault's. I have before said full as much on this term, as the word, or his correction of it, is worth. The sequel of the explanation of the plate 2, is so replete with blunders, founded on the previous mistake, that I cannot persuade myself to believe Mr. Stuart was the author of them; or if he was, that his ill state of health, and embarrassment of mind, at the time he put the materials together, which compose this, and some other parts of the letter press, rendered him incapable of accurate recollection. And; it is much to be wished, that the above, and some other glaring inconsistencies, in the printed copies, that accompany the useful, and interesting designs, published in the plates, were duly revised, and such degrading passages as the above and subsequent, rectified; which might be printed in very few sheets, and published, both for the credit, as well as for the further utility, of so excellent and so valuable a collection of designs. I hope the Society of the Delitanti, may at a future time, take the matter into their consideration, and render the present printed expositions more concordant with the plates. They must be convinced, how exactly the Minerva Polias, coincides with Vitruvius's first variation from the plan of a Tuscan Temple, with which he begins his 7 chap. 4 book: and that the Parthenon is totally foreign from every kind of Tuscan Temples, set forth
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by Vitruvius, in that chapter: and hereunder correctly given, after the following exposition of the Grecian Temples.

Vitruvius, § book, 1 chap. describes seven different styles of Grecian Temples, viz, the *ædes in antis*, called, by the Greeks, *ἱεὸς ἐν ἀντιστοιχίᾳ*, having *antæ* on the faces of the walls, which encompass the cell, and 2 columns between the *antæ*, and above them the pediment in such symmetries, as are established in this book. An example of this is in that of the three dedications to fortune, nearest to the Gate Collina.——This *ædes in antis*, Perrault has represented surrounded by 4 walls, instead of 3, placed the 2 columns at a distance from the front, instead of disposing them *between* the *antæ*, where he, instead, erects his fourth or front wall, raises a pediment over his 2 columns, and another over the whole front, and both of an *enormous* and *unprecedented* height; and has perverted Vitruvius's description altogether, into a most absurd design.

The second kind of Temple, by Vitruvius, is the *Prostyle*, this has 4 columns in front, he cites an example of this, in the Jupiter and Faunus.

The third, is the *amphiprostyle*, with 4 columns at the postern end, as well as at the front: and pediments over them.

The fourth style is, the *Periptere*. This has 6 columns, front and postern and on each side, counting the angular ones again, 11; which are, on the 4 sides, one intercolumn's space distant from the walls, to form walks all round the Temple: as in the portico of Metellus, in the Jupiter Stator, in the Hermodus: and at the works of Marius dedicated to Honor and Virtue, but without postern columns, built by Mutius.

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The fifth species of Temple was the pseudodiptere, this, says Vitruvius, had 8 columns, front and postern, and, reckoning the angular again, 15 on each side : but the ends of the side walls were opposite to the fourth columns, in front and postern, so that a space, equal to 2 intercolumns and one diameter, was the distance from the walls to the rows of columns. There is no example of this at Rome, but at Magnesia that of Diana by Hermogenes the Alabandine, and that of Apollo by Mnestres.

I must just observe here, that, although the Alabandi, were deemed rather a stupid race, Vitruvius by no means intended to cast a reflection on Hermogenes, by naming his country, for he, elsewhere, extols his ingenuity for having invented this pseudodiptere, and also the eustyle intercolumniation ; as much as to say, in the present case, built by Hermogenes, though an Alabandine.

The sixth style of Temple is the Diptere. This has 8 columns front and postern, but double rows throughout the circuit of the walls. As in the Doric Temple of Quirinus, and in the Ionic, of the Ephesian Diana, planned by Ctesiphon.

But the Hypethre, the seventh kind, has 10 columns in front, and in the postern front, and every thing which the Diptere has, except the columns, which this has in the interior part, doubled in the height, and at a distance from the walls, forming a peristyle circuit, (like porticoes) the area in the middle being open to the sky without roof ; and entered by folding-doors, both at front, and at the postern. Now we have no example of such a Temple, at Rome, says Vitruvius, But at Athens, (we have) the Octastyle, and
(another)

(another) in the Temple of Jupiter Olympias. "Sed Athenis Octastylus and in Templo Jovis Olmpii."

This octastyle, we are certain was the Parthenon, proved by Mr. Stuart himself, on the authority of Sir Geo. Wheler and Doctor Spon, and, still more satisfactorily, by his own discovery of the little circles, which are, doubtless, the peripheries of the small double columns; proved, I say, by these testimonies to have been originally hypethre, yet not being, with only 8 columns, an adequate example of the hypethre, just described, which had 10; Vitruvius, citing it as an hypethre, guarded us from mistaking it for a decastyle, saying, no example at Rome, but at Athens, there is the octastyle, and the Olympian Jupiter.

This Olympian Temple, at Athens, completed, Vitruvius informs us, in his preface to his 7 book, by the Roman architect, Cossutius, Mr. Stuart again, himself, very ingeniously ascertained, from the 17 standing columns, to be decastyle, and has left us in possession of the method, he took, to discover it, in a plate at the end of his 1 chap. 2 vol. which demonstrates, this Temple had 10 columns in front, and conclusively proves it to be an adequate example of the hypethre described by Vitruvius: who asserts expressly it was to have 10 columns in front.

Now Mr. Stuart, 1 chap. 2 vol. at top of 7 page, says,....."the Temple of Jupiter, at Athens, which I have inadvertently said was an Octastyle, when it certainly was a decastyle. I was led into this error by Philander, and those editors of Vitruvius, who since his time have, as before observed, followed his conjectural emendations; and who, instead of, *but an Octastyle at Athens, and in the Olympian Temple*, read, *but an*

Octastyle at Athens in the Temple of Jupiter Olympius."

Then, in the very next paragraph, Mr. Stuart has this astonishing sentence. "The plan of the Athenian Temple of Jupiter Olympius, which I shall give at the end of this chapter, will shew that it was a decastyle, and therefore could not possibly be that meant by Vitruvius, but some other: how then are we to understand him? I shall venture to suppose, that it is the Olympian Temple, in the territory of Elis, he has here mentioned:"

The evident contradiction and confusion of this part of the paragraph, must be apparent to every reader. Vitruvius describes the hypethre with 10 columns, Mr. Stuart proves the Olympian, at Athens, to have also 10 columns, and then asserts, it is not possible Vitruvius could mean this Temple, to be an instance of such a hypethre, because it *had* 10 columns! I could point out several other inaccuracies, in the letter press, if the limits of this publication would permit; and while I rejoice, that our Country is in possession of the inestimable treasure of the plates in this work, I cannot but lament the disparaging oversights in the verbal account published in the name of the author, who after such diligent researches, and so long absence from his Country, deserved a better fate, than to meet, on his return, with embarrassments, which broke his spirits, and which I much suspect, was the occasion of the incorrectness discovered in his verbal descriptions.

But to return to the subject of Tuscan Temples; in chap. 7, book 4, of Vitruvius. Besides the variation from his first Temple, which so exactly corresponds with the disposition of the Minerva Polias, as not to leave room in the least to doubt of it's being the Minerva
to

to which Vitruvius alludes : some, continues Vitruvius, assuming the disposition of the Tuscan, (he means the first angular Temple with 8 columns in the pronaos) transfer it to the Corinthian and Ionic ordination ; for retaining the columns in the middle region opposite the four antæ of the walls, preserving the form of the Tuscan, they gave the columns and intercolumns the symmetries proper to the Corinthian and Ionic.

And others again, omitting the side walls of the little cells, had recourse to columns and intercolumns, instead of them, and thus produced a more free access to the cell left in the middle, and by disposing 5 columns on each side, formed a kind of wings, which work may be called a pseudoperiptere.

Thus there are four kinds of angular Tuscan Temples, all on the same proportion of the site, viz, 5 of front by 6 of length, The first, with 3 cells and 8 columns disposed in 2 rows, breadthwise, in the pronaos. The second, with 3 cells and 6 columns, 4 in front and one at each shoulder of the pronaos. The third, like the first, but the work done in Corinthian or Ionic symmetries, instead of Tuscan. And the fourth, with the middle cell only, and with 14 columns, 4 in front, 5 on each side, reckoning the front angular ones over again, and the 2 before the antæ of the cell walls, in the middle of the area of the pronaos. It is to be observed, that, though Vitruvius calls this a kind of false periptere, it is a Tuscan, not a Grecian, pseudo-periptere ; from which Grecian periptere, were the postern row of columns taken away, there would be a pseudo-periptere containing 24 columns.

“ Now there are Rotunda Tuscan Temples,” says Vitruvius, “ of which some are called Monopteres, and others

others Peripteres. The Monoptere is without a cell, and has a tribunal and a platform, elevated $\frac{1}{2}$ part of it's diameter. Upon the stylobates, columns are erected, in height, equal to the diameter of the platform, taken from the extremities of the walls of the stylobates."

From the description so far, it appears, that, what he calls the stylobates, is the circular wall, which, in the parts right under the bases of the intended columns, was to be something thicker, than the extent of the base's plinth, the other parts under the intercolumn less massy. The area within the circle filled up with inferior materials to carry the pavement.

"The height of the column, including base and capital, is divided into 10 parts, of which one is the diameter: the epistyle is to be $\frac{1}{2}$ a diameter high: the freeze and all other things disposed, above the epistyle, are to be as I have written in the third book."

By the conclusion of this paragraph, it appears, that the symmetries of the columns and entablature are Grecian, and nothing, then, in this monoptere peculiarly Tuscan, except the circular form. The steps to ascend to the platform, as nothing is said of them, we may imagine, where through the whole circuit.

"But if the Temple is a periptere," continues Vitruvius, "there are to be 2 steps, and the stylobates raised from the level on which the under one stands. Then the walls of the cell are to be erected on the platform, at the distance from the stylobates of the width (diameter) of the platform, and in the middle an opening left, for the folding doors. And the diameter, in the clear of the cell, is to be equal to the height of the columns, which, on the stylobates in the circuit, are to be of the same proportions and symmetries, as in the other
other

other Rotunda. The dome (tholus) is to be $\frac{1}{2}$ the diameter of the building high, exclusive of the flower. And the flower is to be the size of a capital of one of the columns, besides the spire. All the rest as before."

It seems necessary, in planning this periptere, to settle first, the diameter of the inside of the cell: we will take it at 20 feet; the diameter of the column in the same symmetry as before, will be 2 feet: the walls of the cell, ft.1, in.2, thick, but where the pilasters fall, something more: from the outside of the wall to the extremity of the platform, ft.6, in.10: and the extent of the torus of the base being ft.2 in.4, (for there should not be plinths to the bases, or at least, they should be circular) the walking space will be ft.4, in.6: in the clear of the frame, for the folding doors, ft.4 in.2: the intercolumns measured on an occult circle scribed through the centers of the columns, will be ft.6, in.8 $\frac{1}{4}$, being=3 diameters and 22 minutes: and the number of columns is 12, and with the torusses of their bases to project to the extremity of the platform: and the 2 steps, as ordained by Vitruvius, about 14 inches in the tread, and about 7 inches to the riser, and the right foot commencing will land, as it ought, on the platform.

The flower, mentioned by Vitruvius, is an ornament on the summit of the dome terminating in a pyramidic form. I have assigned only 12 columns to the circuit of the wing, intending pilasters. Vitruvius, however, says nothing of antæ, or pilasters, on the sides of the door-way, nor of the number of columns; and 12 producing a greater intercolumn, than diastyle, would require timber epistyles. But if this Rotunda was with stone epistyles, there should be 14 columns at least: all the rest as above.

Thus

Thus far, I have attentively investigated the documents of Vitruvius throughout his 7 chap. 4 book, on Tuscan Temples, which, from the instance alone of the Minerva Polias, are sufficiently ascertained to be of Grecian origin : for though the ordination in Mr. Stuart's design of the pronaos of that Temple, exhibits diameters rather larger, and intercolumnus somewhat different, the middle one not being larger than the others, yet the disposition and number of columns are exactly what Vitruvius states as the original Temple dedicated to this Minerva, before the Persian conflagration, whereof the remains were as well known, and perhaps, better understood by Vitruvius, who studied, at Athens, than by Mr. Stuart himself, who visited and took such pains to ascertain every particular as he found them, with a kind of Ionic capital to the columns, certainly altogether dissimilar to the capitals Vitruvius describes for the Tuscan. But Vitruvius does not cite the restored Minerva Polias, but the first original one, destroyed by the Persians, at the same time as the ancient Parthenon was burnt ; and the traces of both, were sufficiently discovered by Vitruvius, and enabled him to say the variation from his first described Tuscan Temple, was the very symmetry, ordination and disposition of the original Polias, and not the restored one, "*Hoc genere primo facta ædes*" viz, "of this kind was the first Temple built," this evidently implies, that the subsequent restoration of that Temple was not the object of the allusion ; and we may fairly draw this inference, that the, *primo facta ædes*, i. e. the Temple at first erected, or, which is the same thing, the first Temple was adequately an instance of the style of architecture termed, by Vitruvius, Tuscan ; and, of course
invented

Invented by the Greeks, and first executed in the Acropolis at Athens, long before even the Corinthian style was there known. No doubt, the emigrants from Athens, and its dependencies, who settled in Hetruria, or Tuscany, brought with them, that peculiar style of Temples, called after that country in which they settled; hence, Tuscan architecture, appears to be more ancient than Doric, Ionic, or Corinthian; which last style, does not appear to have been practised at Athens, previously to the famous Olympian Temple, being finished by Cossutius: of whose ingenuity, skill, knowledge, and judgment, as well as of the magnificence, and perfection of the design of the Temple itself, Vitruvius speaks with a warmth approaching to enthusiasm in his preface to his 7 book.

Of this celebrated Temple only 17 columns were standing when Mr. Stuart was at Athens, who very ingeniously ascertained the ichnographia of the Temple by these columns, which to any, but a professional observer, doubtless appeared to be in a confused and unintelligible disposition. By them, however, he has, most satisfactorily, proved, the Temple had 10 columns, in the outer row on the east front; and from a direct line through the centres of 4 columns belonging to the outer row of the south side, commencing with the angular column at the south-east corner, and continued at discretion along the south side, he then directed a line, at right angles with the former, towards a solitary column at the west-end, and beyond the middle of the Temple, moving the second line in that right angular direction, until it cut the centre of the said solitary column; and the point of intersection, he rightly concluded, must be the centre of a column: he next calcu-

lated, by the diameters, and intercolumns, of the 4 standing columns, at the east end of the line, and found the point, aforesaid, to be the centre of the twentieth column. But Mr. Stuart conjectures, that this was not the west angular column, though in a range with the western solitary one : because the base of that, is similar to the bases of the columns in the row, next to the south side wall, which bases differ in their symmetry, a small matter, from those under the outer columns ; and from this circumstance, he infers, there must have been a row of columns, at the western end, beyond the solitary column ; and if so, he argues, there must have been 21 columns on the outer row of the side. This is specious reasoning, but it does not appear to me, conclusive. First,

Because the difference in the symmetrical heights of the torusses of the bases, is both trifling, and the only dissimilarity ; and I have myself experienced much greater variations, in the niceties of symmetry, from the inattention of workmen : in executing above 100 bases, one man, we cannot imagine, wrought them all ; and the different hands, employed, might easily make a mistake, and there can be no better reason assigned for any difference in the bases any where amongst the external columns, either of the outer row, or of the row next to the wall : since no skilful and well informed architect would imitate such a various symmetry.

Against Mr. Stuart's conclusion, the following arguments appear more forcible and convincing, than those from which he draws his inference.

Vitruvius, 3 book, 3 chap. says, " those architects seem to have erred, who, by doubling the number of a Temple's front *columns* instead of the *intercolumns*, did not procure, as nearly as might be, a length of work equal

equal to twice the width." For example, 8 columns in front, have 7 intercolumns, and the side, by receiving 14 intercolumns, will comprize 15 columns; which *want* only one diameter of a column to complete twice the width: but if double the number of front *columns* are given to the side, producing 16, then the length will *exceed* twice the width, by the quantity of a whole intercolumn, which, regularly, always exceeds one diameter; therefore, censured by Vitruvius, as not approaching, as nearly as it might, to the desirable proportion. Now, allowing Cossutius, the architect of the Olympian Temple, 10 columns in front, according to Vitruvius, he should have disposed only 19 on the side: but Mr. Stuart, *conjectured*, there were 21, and *clearly proved* there were 20. Does Vitruvius, then, adverting to this Temple, and to it's architect Cossutius, pass any censure on him, for having disposed 20 columns on the side? On the contrary, he says, (preface to 7 book,) "*magna solertia scientiaque summa civis Romanus Cossutius nobiliter est architectatus.*" But how very ill would the character of *great skill* and *consummate knowledge*, suit the architect, who should have caused the length to have exceeded twice the width, by above 30 feet=5 diameters of the column, (the diameter by Mr. Stuart, is ft.6, in.3; width of front 171 feet; length in 21 columns, ft.372, in.1½; copied from the plate.) Certainly, such an excess and infraction of the desirable proportion, would not have escaped the notice of Vitruvius, who had, doubtless, frequently considered the perfections of this Olympian Temple, which he so warmly extols. And it appears, upon a close inspection of the dimensions, Mr. Stuart has minutely stated, that Cossutius contrived to preserve the requisite proportion, even with 20 columns on the side, nearly as

exact, as Vitruvius suggests with 19, by contracting the intercolumns, which were opposite the side wall, in number 13; taking from each a few minutes, both to gain *that end*, and also to allow the three intercolumns, at the east end of the southern rows, to have the intercolumns a trifle wider, than those on the front, to render the three walks, of the triptere portico, more commodious. I say, *triptere*, for this Temple, as Mr. Stuart has transmitted it's ichnographia, was *diptere* only on the sides, having there two rows of columns, but in the front portico, it has *three* rows: and, no doubt, the postern portico, had a similar disposition, which Mr Stuart has expressed; but, prepossessed with the notion of the solitary column at the western end; being one of the middle row of that portico, for reasons above stated, and combated, he continues, the side wall, to an extent, equal to 15 columns, and 14 intercolumns; but, with 20 columns on the side rows, (which I presume the reader must be convinced, was the number,) then the side wall, to allow a similar portico at *that end*, as at the east end, can only extend equal to 14 columns and 13 intercolumns.

If this publication, should meet with that encouragement, I must not say, which the work itself deserves, but I may say, which my labours and attention to the documents of Vitruvius, seem to entitle me to expect; I may possibly publish, on some future day, by way of supplement, a few explanatory designs, amongst which shall be this Temple, with the disposition of the hypetral cell; for that given, by conjecture, in Mr. Stuart's plate, is, to me, by no means satisfactory. Though, I trust, no architectural practitioner, will be at a loss, to delineate from the verbal descriptions in this work.

THE END.

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